# DOCUMENT RESUME

ED 268 129 TM 850 693

AUTHOR Wilson, Kenneth M.
TITLE Factors Affecting GMAT Predictive Validity for Foreign MBA Students: An Exploratory Study. Research Report.
INSTITUTION Educational Testing Service, Princeton, N.J.
SPONS AGENCY Graduate Management Admission Council, Princeton, NJ.
REPORT NO ETS-RR-85-17
PUB DATE May 85
NOTE 96p.; Some pages have small print.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC04 Plus Postage.
DESCRIPTORS Age Differences; *College Entrance Examinations; Correlation; *English (Second Language); *Foreign Students; Grade Point Average; Graduate Students; *Graduate Study; Higher Education; *Language Proficiency; Language Tests; Mathematics Tests; *Predictive Validity; School Size; Scores; Sex Differences; Verbal Tests
IDENTIFIERS *Graduate Management Admission Test; Masters of Business Administration; Pooled within School Correlations; Test of English as a Foreign Language

## ABSTRACT

This study was designed to explore the effect of selected test and background variables on the pooled within-school relationship between Graduate Management Admission Test (GMAT) scores and first year grade average (FYA), and to assess the potential role of selected Test of English as a Foreign Language-related variables as supplemental predictors of FYA for foreign students. Data were supplied by 59 United States schools of management for 1,762 foreign non-native speakers (English second language) and 157 foreign native speakers (English primary language). Continuous variables were standardized by school--that is, expressed as deviations from school means in school standard deviation units--and then pooled for analysis. It was found that the mean relative standing of various country-contingents in terms of first year grades tended to correspond more closely with relative standing on the less valid verbal measure than with standing on the more valid quantitative measure. One conclusion was that for these samples of non-native speakers of English, differences in English-language background affected (artificially depressed) both performance on the GMAT verbal measure and first-year performance in the Masters of Business Administration programs. Appendices provide numerous figures, scatterplots, and an interim report dated March 1984. (PN)

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RESEARCH REPORT

# FACTORS AFFECTING GMAT PREDICTIVE VALIDITY FOR FOREIGN MBA STUDENTS: AN EXPLORATORY STUDY

Kenneth M. Wilson

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Educational Testing Service
Princeton, New Jersey
May 1985

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# FACTORS AFFECTING GMAT PREDICTIVE VALIDITY FOR FOREIGN MBA STUDENTS: AN EXPLORATORY STUDY

Kenneth M. Wilson

Educational Testing Service

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# Abstract

The primary aim of this cooperative study was to assess the role of selected English-proficiency related test and background variables as moderators of the relationship between scores on the Graduate Management Admission Test (GMAT), and first year average grade (FYA) in samples of foreign MBA students. The study was guided by working hypotheses specifying that GMAT/FYA correlations would be systematically higher for students with higher levels of English proficiency than for those with lower levels of English proficiency. Levels of proficiency were defined operationally (a) by native-English speaking vs non-native English speaking status, (b) score levels on the Test of English as a Foreign Language (TOEFL), and (c) score levels on a Relative Verbal Performance Index (RVPI)—a derived test variable reflecting level of GMAT verbal score relative to that expected for U.S. examinees with given quantitative scores. It was also hypothesized that GMAT/FYA correlations would be higher (a) for students from countries whose U.S.-bound nationals typically earn higher average scores on TOEFL than for students from countries with typically lower-scoring student contingents, and (b) for samples that were completely homogeneous with respect to country of citizenship than in more general samples.

Data were supplied by 59 U.S. schools of management for 1,762 foreign non-native speakers of English (English second language or ESL) and 157 foreign native speakers (English primary language or EPL). Continuous variables (e.g., GMAT verbal and quantitative score, TOEFL Total score, FYA, and so on) were standardized by school—that is, expressed as deviations from school means in school standard deviation units—and then pooled for analysis.

GMAT quantitative scores were found to be more valid than GMAT verbal scores for essentially all subgroups of foreign students. For the EPL foreign sample, GMAT V/FYA and Q/FYA correlations were similar to medians reported by the Graduate Management Admission Council (GMAC) validity study service (VSS) for 85 samples of U.S. MBA students; this was true as well for ESL students scoring 600 or higher on TOEFL and for those in the upper two-thirds with respect to the RVPI index. GMAT/FYA correlations were higher for students from European countries, and from Asian countries with an established English-speaking tradition (e.g., India, Malaysia, the Philippines), than for students from other Asian countries (e.g., Taiwan, Japan, Indonesia, Korea) and the Middle East. TOEFL/FYA and GMAT V/FYA correlations were similar.

It was found that the mean relative standing of various country-contingents in terms of first year grades tended to correspond more closely with relative standing on the less valid verbal measure than with standing on the more valid quantitative measure. One conclusion was that for these samples of non-native speakers of English, differences in English-language background affected (artifactually depressed) both performance on the GMAT verbal measure and first-year performance in the MBA programs.

Findings suggested that a set of subgroup prediction systems would likely be better than any general system for foreign MBA students.

# Summary

The primary aim of this exploratory cooperative study was to assess the potential role of selected English-proficiency related test and background variables as moderators of the relationship between scores on the Graduate Management Admission Test (GMAT) and first year average grade (FYA) in samples of foreign MBA students. Accordingly, it was concerned primarily with whether or not GMAT/FYA correlations tend to be systematically higher (lower) for foreign students classified according to variables identified as potential moderators. The study was not designed to investigate questions regarding predictive bias, or comparability of regression systems for predetermined classifications of foreign students, but rather to determine whether there are subgroups of foreign students for which GMAT/FYA correlations are likely to differ systematically.

It was hypothesized that GMAT/FYA correlations would be moderated by English-proficiency related variables—that is, that correlations would be higher for students with higher levels of English proficiency than for those with lower levels of proficiency as defined operationally by (a) English primary language (EPL) versus English second language (ESL) status, (b) score levels on the Test of English as a Foreign Language (TOEFL), and (c) score levels on the Relative Verbal Performance Index (RVPI), a derived test variable reflecting level of GMAT verbal score relative to that expected for U.S. examinees with given quantitative scores.

It was also hypothesized that GMAT/FYA correlations would be higher for samples that were relatively homogeneous with respect to English-language background variables, nested in countries of citizenship, than for samples that were relatively heterogeneous with respect to such variables; more specifically, that correlations would be higher for students from countries whose U.S.-bound nationals typically have higher average scores on TOEFL than for students from countries with typically lower-scoring student contingents (Exhibit A). It was further hypothesized that GMAT/FYA relationships would tend to be stronger in samples that were completely homogeneous with respect to country of citizenship than in the more general classifications.

Data were supplied by 59 schools of management for 1,762 foreign ESL students and 157 foreign EPL students, largely those entering in fall 1982 (Tables 1 and 2). Some 140 different countries were represented in the sample, but 36 countries accounted for about 90 percent of the total (Table 3). TOEFL scores were available for 1,203 of the foreign ESL students. Means of the the total EPL and ESL samples were significantly different on all study variables except GMAT-Q scores, sex, and year of birth. Both samples had very high quantitative means (35+), but the verbal mean of the ESL sample was depressed (24+ as compared to 33+ for the EPL sample). The ESL sample was highly selected in terms of English proficiency as measured by TOEFL. Some 23 percent of the ESL sample had U.S. undergraduate origins. There were marked differences among the leading country-contingents with

respect to all study variables.

The analysis focussed primarily on data for 1,762 foreign ESL students that were pooled across all schools after within-school standardization; prior to pooling, the continuous predictor and criterion variables were subjected to a within-school z-scale transformation using parameters for foreign ESL students. Scores for EPL students were z-scaled with reference to the ESL distributions. The various study hypotheses were evaluated using pooled, within-school correlation matrices for the relevant classifications of students. To assess the potential role of TOEFL and TOEFLEVL scores (the mean TOEFL score of all U.S.-bound TOEFL-takers by country, ascribed to students from the respective countries) as supplemental predictors these scores were added to a battery composed of GMAT verbal and quantitative scores.

Principal findings were as follows:

- GMAT/FYA correlations were higher for the EPL than for the combined ESL sample (see Table 4 and related discussion); coefficients for EPL students were comparable to those reported for general samples of MBA students by the GMAC Validity Study Service (VSS), but those for the heterogeneous ESL sample were lower.

- Within the foreign ESL sample, in analyses involving 1,203 students with TOEFL scores, GMAT/FYA coefficients were found to be relatively high (comparable to VSS medians for general samples) for students scoring 600 or higher, but comparatively low in two lower-scoring groups (Table 5).

- In regression analyses based on data for the GMAT/TOEFL sample, TOEFL Total (T-T) and TOEFLEVL (T-L) scores had significant weights when included in a battery with GMAT verbal and quantitative scores. When T-T was substituted for GMAT-V as the primary verbal predictor, the resulting multiple correlations with FYA were comparable to those involving V as the principal verbal predictor (Table 6).

- When students were classified according to level on the Relative Verbal Performance Index (RVPI), GMAT/FYA correlations were relatively high in the two higher RVPI classifications, representing 1,152 of 1,762 ESL students, than in the lower-scoring classification (Table 7 and Table 8), consistent with expectation.

- GMAT/FYA correlations were found to be moderated when students were classified according to TOEFLEVL, as higher (T-L 550+) or lower (T-L < 500). As hypothesized, correlations were higher for the higher T-L than for the lower T-L classifications (Table 9).

- When students were classified into 23 analysis groups, most of which were homogeneous with respect to country of citizenship, it was found that in the majority of groups, GMAT-Q/FYA correlations were higher than the corresponding coefficient in the total ESL sample while the opposite was true for GMAT-V/FYA coefficients (Table 10); GMAT-V/FYA coefficients in samples classified by country tended to be lower than the corresponding coefficient in the combined ESL sample. This latter finding, which was not expected, was explained statistically by a relatively close association between the T-scaled verbal and FYA means of the analysis groups—groups with higher T-scaled FYA means tended to be those with higher means on the verbal test rather than on the quantitative test (the more valid predictor of FYA). This result is understandable if it is assumed (a) that differences among analysis groups in characteristic levels of functional English proficiency, associated with countries of origin, affected both performance on the GMAT verbal items and performance during the first-year in MBA programs.

o GMAT/FYA coefficients for certain of the analysis groups were considerably lower than typical. Both selection-related and English-proficiency related factors appear to be involved (see figure 1, Table 11, and related discussion).

o For foreign ESL students with U.S. undergraduate origin, the UGPA/FYA correlation was found to be comparable to the median UGPA/FYA coefficient reported for general MBA samples by the GMAC VSS, but was quite low in the subgroup with diverse international undergraduate origins.

The findings suggest that for foreign nationals from major English speaking societies, whose linguistic, cultural, and educational backgrounds are very similar to those of U.S. students, GMAT scores are likely to be as valid as they are for U.S. students, the targeted test population.

For general samples of foreign ESL students, performance on the GMAT quantitative measure does not appear to be affected by English-language background variables; this measure appears to maintain its construct validity across linguistic-cultural boundaries.

However, in samples of foreign ESL students, the GMAT verbal section appears to be measuring differences in the functional English-language ability (English proficiency), associated with countries of citizenship, as much as (in addition to) English-language verbal reasoning ability (the test-construct in samples of U.S. students). And, the relative standing of various country-contingents in terms of first-year MBA performance (mean T-scaled FYA) tended to correspond with their relative standing on the GMAT verbal measure.

To the extent that average differences in FYA for students classified by country reflect differences in average English language proficiency, questions are raised regarding the meaning of the average FYA differences. Students with limited English language backgrounds, for example, may know more than they are able to demonstrate through classroom participation, written examinations, and other assignments. Exploratory use of personal assessment techniques would be useful in assessing this possibility.

Generally speaking, study findings suggest that there are subgroups within the general ESL population for which GMAT/FYA relationships are likely to differ systematically. A major implication is that a moderated prediction system for subgroups of foreign students is likely to be more effective than any general system.

A classification (subgrouping) scheme based on country of citizenship appears to have considerable promise; most of the moderating effect associated with classification by country may be realized by using clusters of countries, rather than individual countries, as the basis for operational subgroup-classification. An illustrative classification, based on study findings, is provided.

Classification of students according to the English-proficiency related test measures also appears to have promise in a moderated system.

Further research is needed (a) to assess the comparability of regression systems for subgroups of foreign students based on the variables identified as moderators in this study and (b) to determine the practical utility of a moderated prediction system. Given the expected small size of foreign ESL samples in individual schools, and the apparent need for a moderated-prediction system, a model that is capable of treating data for a large number of small samples appears to be necessary to the development of such a prediction system. A statistical model based on empirical Bayesian concepts, has been applied by Braun and Jones (1981, 1982) in studies involving small samples of minority students in several schools of management and a number of small graduate departmental samples, respectively. This model would seem to be adaptable for application to the complex research problem of developing and testing the utility of a moderated-prediction system for foreign ESL applicants.

Results of the present study, like those of studies of the characteristics and the test performance of foreign nationals taking the Graduate Record Examinations (GRE) General Test (Wilson, 1984a, 1984b, 1982c), and of previous studies of the impact of language background on GMAT performance (Powers 1980; Wilson 1982c), indicate that English language "verbal ability" tests are not measuring the same construct in samples of non-native English speakers as in samples of native speakers, U.S. or other. Thus, the verbal scores of U.S. and randomly selected foreign ESL examinees cannot be assumed to be comparable—that is, cannot be assumed to reflect valid differences in verbal reasoning ability. This is a factor to be carefully weighed in the design of future validation research, especially in considering study designs that might call for pooling verbal test data for U.S. and foreign ESL students; differences in construct validity raise important questions regarding the interpretation of pooled within-school GMAT/FYA correlations based on data for combined U.S. and foreign-ESL students.

# Acknowledgments

This study was sponsored by the Graduate Management Admission Council. Data were supplied by study coordinators from 59 schools of management, without whose cooperation and interest the study would not have been possible.

Richard Harrison provided assistance in computer programming and data analysis. Frances Livingston helped in preparing the manuscript.

Henry Braun, Lawrence Hecht, and Donald Powers contributed to the evolution of the study report through critical reading of various versions of the manuscript and numerous helpful suggestions. However, they should not be held responsible for any limitations that remain; these are solely the responsibility of the writer.

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# FACTORS AFFECTING GMAT PREDICTIVE VALIDITY FOR FOREIGN MBA STUDENTS: AN EXPLORATORY STUDY

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## Introduction

The Graduate Management Admission Test (GMAT) is intended for use in evaluating the academic qualifications of applicants for admission to graduate schools of management. GMAT provides measures of verbal and quantitative reasoning abilities (GMAT-V and GMAT-Q) and also reports a total score. The examinee population taking GMAT is made up predominantly of U.S. citizens, to whom the test is oriented linguistically, culturally, and educationally. However, the GMAT program also serves foreign nationals—during 1980-81, for example, it is estimated (GMAC 1982) that some 27 percent of all examinees tested were foreign nationals from more than 125 countries.

Foreign examinees differ from U.S. examinees, and among themselves, with respect to cultural, educational, and linguistic background variables, nested primarily in country of citizenship. For example, management-school-bound foreign nationals from different non-native English speaking countries differ markedly in average levels of developed proficiency in English as a second language as measured by the Test of English as a Foreign Language or TOEFL (Wilson 1982a, 1982b, Powers 1980), which is designed for use by foreign nationals to demonstrate their English proficiency (ETS 1981).

The average quantitative performance of foreign GMAT examinees for whom English is a second language (foreign-ESL examinees) is comparable to that of the general GMAT population, but the average verbal performance of the group (at about the 15th percentile relative to all GMAT examinees) is much lower (GMAC 1982, Powers 1980, Wilson 1982c). The depressed performance of foreign-ESL examinees on GMAT Verbal may be attributed primarily to factors associated with their less than native levels of proficiency in English, including lower-than-native levels of speed of verbal processing; this is evidenced, for example, in the lower completion rates of foreign examinees on the GMAT (Sinnott 1980). Similar patterns of depressed verbal test performance relative to quantitative performance have been found to be characteristic of foreign-ESL examinees who take the Graduate Record Examinations (GRE) General Test (see Wilson 1984a, 1984b, 1982c for detailed data).

There is a substantial body of evidence regarding the predictive validity of GMAT scores and other admissions measures, such as the undergraduate GPA, in general samples of first-year MBA students—for example, 85 studies were conducted by the Graduate Management Admission Council (GMAC) validity study service (VSS) during the period 1978-79 through 1980-81 (Hecht and Powers 1982). However, evidence regarding the validity of GMAT scores for foreign nationals, especially non-native English speakers, who apply for admission to U.S. schools of management is limited.

During the period covered by the 85 general-sample VSS studies, for example, only six schools submitted data to the GMAC VSS for subgroups of non-U.S. citizens. In these six studies, the verbal score means for foreign subgroups were consistently lower than those of their U.S. classmates. GMAT scores were positively correlated with first year average grade (FYA) in the foreign samples, and the first year average grade for the foreign students was roughly comparable to that of domestic students despite the disparity in their verbal score averages. However, the foreign student subgroups typically were quite small—too small to permit reliable estimates of GMAT/FYA relationships. In addition, the studies were not designed to control for national origin, English language background, undergraduate origin (U.S. vs other), or other background variables that may reasonably be expected to moderate the relationship between GMAT scores and first-year performance in MBA programs for foreign students.*

It is reasonable to hypothesize, for example, that in samples of foreign ESL students the predictive validity of GMAT scores (especially scores on the verbal test), may be moderated by level of English proficiency—that is, in samples of foreign-ESL students who have acquired a relatively high level of English proficiency, the validity of GMAT scores should tend to be greater than for students with relatively low levels of developed English proficiency For these latter students, differences in GMAT Verbal scores, for example, may reflect differences in level of acquired proficiency in English rather than differences in level of developed verbal ability.

Similarly, it is reasonable to hypothesize higher GMAT/FYA correlations for students from non-English speaking societies that are similar in linguistic-cultural-educational heritage to the United States (e.g., Western Europe), and countries in which English is an official and/or academically prominent language (e.g., India, Nigeria), than for students from societies whose heritages are less similar (e.g., Asian and Mideastern countries). And, apart from the foregoing, GMAT/FYA correlations might be expected to be higher in samples that are homogeneous with respect to national origin than in samples that are heterogeneous in this regard, given the extreme diversity among countries with respect to the patterns of English language acquisition and use, culture, and educational programs.

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*Research concerned with "moderator" variables has been characterized by lack of consensus regarding definition and methodology (see, for example, Journal of Applied Psychology, Vol. 56, 1972, pp. 245-251, Feature Section: Moderator Variables). However, one consistent theme has involved the notion that predictor-criterion correlations are likely to be systematically higher (lower) in some subgroups than in others. For example, there is some evidence that test validities tend to be higher for women than for men in a number of undergraduate and secondary school settings, and sex is said to moderate the relationship between academic predictors and criteria (e.g., Rock, Barone, & Linn 1967). The differences by sex in predictor-criterion relationships are presumed to be due to sex differences in attitudes toward academic work, persistence, work habits and the like. Similarly,"degree of motivation" would be expected to moderate the relationship between measures of "aptitude" and measures of "performance"—for example, aptitude-performance relationships should be stronger in highly motivated than in poorly motivated groups. This study is concerned with the extent to which GMAT/FYA relationships are systematically moderated by selected continuous and dichotomous variables that reflect differences in level of English proficiency.

It is also reasonable to expect the predictive validity of the previous academic record, as indexed by the undergraduate grade point average, to be higher for foreign nationals who completed their undergraduate work in the U.S. than for students with diverse, international undergraduate origins.

## Study Objectives and Design

The primary aim of this exploratory study was to assess the role of selected test and background variables (such as TOEFL scores, country of origin, and undergraduate origin) as moderators of the relationship between GMAT scores and first year performance (FYA) in samples of foreign MBA students. Accordingly the principal interest is in whether or not GMAT/FYA correlations tend to be higher (lower) for students classified according to these potential moderator variables. The study explored the potential utility of selected variables both as supplementary predictors and as moderator variables. The study was not designed to investigate predictive bias or comparability of regression systems for various subgroups, but rather to determine the effect of English proficiency related variables on GMAT/FYA relationships—that is whether or not systematic differences in level of GMAT/FYA relationships are likely to obtain for subgroups differing in linguistic-cultural background.

Data were obtained, through the cooperation of 59 U.S. schools of management, for foreign MBA students (without regard to their U.S. visa or residency status) who entered in fall 1982, as full-time students, and who earned a first year grade point average (FYA). Participating schools provided GMAT scores (verbal, quantitative, and total) and a first year average (FYA) for each study-eligible foreign student, plus information on year of birth, sex, undergraduate origin (U.S. vs other), country of citizenship, and native language, and when available, TOEFL Total scores. Several schools supplied undergraduate GPA (UGPA).

As anticipated, the school-level samples of foreign ESL students were all quite small by usual validity study standards. (The median N for the 59 samples was 26, with a range of Ns between 6 and 77; 22 samples included 30 or more students, 24 samples included between 20 and 29 students, and 13 included fewer than 20). For perspective, only three of 85 general first-year samples studied by the GMAC VSS during the academic years 1977-78 through 1979-80 included fewer than 77 students and the mean sample size was 175 (Hecht & Powers, 1982).

Collectively, however, the participating schools supplied data for 1,924 foreign students. Five students could not be classified by country of citizenship; of the remaining students, 157 (or 8.2 percent) were foreign EPL students (those whose reported native or primary language was English), and 1,762 were foreign-ESL students (non-native English-speakers for whom English was a secondary language), the primary study sample.

## General Methodological Rationale

The number of foreign students in individual MBA programs was too small to yield reliable estimates of the relationship of GMAT scores to student performance or to permit exploration of the role of background factors either as predictors of performance or moderators of GMAT predictive validity. However, given comparable data sets for a relatively large number of small samples of individuals engaged in similar activities but in different settings (e.g., different MBA programs) it is possible to draw meaningful inferences regarding the characteristic patterns of relationships among the variables (that is the pooled within-school intercorrelations of the variables) by basing analyes on combined data from all the settings.

Given objectives like those of this study, a useful approach to pooling data for analysis is to standardize the study variables within each setting (school, program, etc.) before pooling—that is, within each school, for example, express scores on all variables as deviations from school means in school standard deviation units (see, for example, Wilson 1979, 1982d, 1984c). In these studies, pooled within-group correlations were analyzed for relatively large numbers of small departmental samples of graduate or undergraduate students with the aim of assessing the characteristic patterns of relationships between Graduate Record Examinations (GRE) scores (on the General and/or Subject Tests) and graduate or undergraduate grade point average criteria.

o Wilson (1979), for example, employed data for 139 graduate departmental samples, from 39 graduate schools, representing more than 20 different fields of study to estimate typical patterns of criterion-related validity coefficients and regression weights by field. In an analysis involving 54 departmental samples from five fields of study, it was found that in most instances, regression coefficients for GRE predictors based on data for individual departments did not deviate significantly from the corresponding, pooled within-department coefficients. Pooled, within-department data were also employed in assessing the criterion-related validity of the restructured GRE General Test (Wilson 1982d) in a sample that included data for first-year graduate students in 100 departments distributed among eight different graduate fields—59 of the departments were represented by between 5 and 9 students.

o The relationship of item-type part scores on the GRE General Test to undergraduate grades was assessed using pooled, departmentally standardized data for college senior-level students and recent graduates from 437 undergraduate departments representing 12 fields of study and the major undergraduate suppliers of GRE test takers (Wilson, 1984c). The graduate-level studies involved exploratory assessment of characteristic predictor-criterion relationships for subgroups (for example, students classified by sex or ethnic status), and of the relative within-department average standing of subgroups.

Pooled within-school correlations may be thought of as approximating "population" values around which the coefficients for samples from the respective schools will vary, due to selection- or sampling-related considerations (such as restriction of range on the predictor and/or criterion variables) as well as context-specific (situation-specific) validity-related considerations (for example, quantitative methods may be more heavily emphasized in some school curricula than in others).

There is reason to believe that much of the variation in observed validity coefficients for common predictors and criteria across similar settings is explained by statistical artifacts rather than by situation-specific validity-related factors. For example, in an analysis of 726 law-school validity studies (Linn, Harnisch, & Dunbar 1981), some 70 percent of the variation in validity coefficients across studies was attributable to differences in sample standard deviations, estimated criterion reliability, and sample size, respectively. Similar findings have been reported for validity studies involving common selection tests in employment settings (for example, Perlman, Schmidt, & Hunter, 1980).

The present exploratory study was designed to assess the characteristic patterns of within-school relationships among standard predictors (that is, GMAT scores) and a standard criterion variable (namely, first year average in the MBA program, or FYA) for foreign-ESL students, generally, and in subgroups classified according to background variables that on a priori grounds might be expected to moderate (affect systematically) GMAT/FYA relationships. Results of analyses based on pooled, within-school data may be thought of (a) as having generalizable implications for the use and interpretation of GMAT scores for foreign students, (b) as providing insight regarding background variables that need to be incorporated in the design of operational prediction systems for foreign students, and (a) as a useful first step toward the development of prediction systems that take into account the specific circumstances of individual programs.

## Detailed Description of Study Variables

Schools supplied GMAT verbal, quantitative, and total scaled scores and a first year average grade (FYA) for each student, plus information regarding sex (coded male = 1, female = 2), year of birth (inversely related to age), undergraduate origin (U.S.= 1, other = 0), country of citizenship, and native language (coded English primary or native language, or EFL = 1, vs English is the second language, or ESL = 0). A TOEFL total score was supplied, if available, for each student. Presence vs absence of TOEFL was treated as a nominal variable (TOEFL present = 1, not present = 0), labelled YESTOEFL. Only 21 schools opted to provide data on the undergraduate GPA (UGPA).

A standard composite of GMAT verbal and quantitative scores (Q + .6V) was included as a special study variable. The weights involved in this composite reflect the ratio of optimal average weights for these two scores as determined in previously conducted GMAC Validity Study Service (VSS) analyses based on general samples of students from 25 of the schools participating in the present study. This variable is labelled VSSCOMP, for VSS Composite.

### English-proficiency Related Variables

TOEFL total scores (TOEFLTOT) were available for 68 percent of the foreign ESL students. The total score on this widely used test of English proficiency tends to be correlated moderately highly with GMAT-Verbal in general samples of GMAT/TOEFL takers—correlations of approximately .7 have been reported for large samples from the general GMAT/TOEFL population (Powers, 1980; Wilson 1982c). On the strength of this level of relationship between GMAT verbal and TOEFL scores, TOEFLTOT or T-T might be expected to have correlations with academic criteria similar to those for GMAT verbal scores. TOEFL total may be thought of both as a potential moderator variable and as a supplemental predictor of FYA.

Two additional English-proficiency related variables were included in the study. One was intended to reflect characteristic differences among countries in the level of developed English proficiency of their U.S.-graduate-school-bound nationals (TOEFL LEVEL, TOEFLEVL, T-L); the second variable, called the Relative Verbal Performance Index or RVPI was developed (Wilson, 1984a) as an index of an "English proficiency deficit" in the observed GRE verbal performance of contingents of foreign ESL examinees from different countries.

TOEFLEVL. There are marked differences among countries with respect to the TOEFL total means of their U.S.-graduate-school-bound nationals and these differences appear to be relatively stable over time; a correlation of .94 was found between national means of examinees in two testing years, based on data for 129 countries (Wilson 1982a). The differences in TOEFL means may be thought of as reflecting differences among countries of origin in patterns of English language acquisition and usage and associated differences in the general "richness" of the English language backgrounds of students planning to study in the United States. For example, examinees from non-native English speaking societies in which much instruction in higher education is in English (such as India, the Philippines, or Nigeria), or whose native languages and English have numerous common elements (as is the case for many European examinees, for example) typically earn much higher TOEFL scores than those from, say, Asian or Mideastern countries where relatively little formal instruction is conducted in English, and where there is substantial linguistic distance between native languages and English.

Exhibit A shows TOEFLEVL values used in the study for students from a representative array of countries; TOEFLEVL was available for all students (except five for whom country of citizenship was missing). Like TOEFL Total, TOEFLEVL may be useful as a predictor of FYA and/or as a moderator variable. For the present study, the mean of the most recent scores of U.S. graduate-school-bound TOEFL examinees from a given country was ascribed to each student from that country—thus, the TOEFLEVL score for all students from Thailand was 472, Algerian nationals were assigned a score of 505, and so on.

## Exhibit A

### TOEFL Means For Various Contingents of U.S.-Graduate-School-Bound Foreign Nationals, by Planned Analysis Group

| Analysis group | | TOEFL Level* |
|---|---|---|
| 01 | Algeria | 505 |
| | Kuwait | 448 |
| | Qatar | 422 |
| | Saudi Arabia | 443 |
| | Tunisia | 497 |
| | Yemen | 466 |
| | Iraq | 454 |
| | Libya | 448 |
| | Syria | 491 |
| | Sudan | 474 |
| | Egypt | 478 |
| | Lebanon | 501 |
| | Iran | 456 |
| | Jordan | 466 |
| 02 | Thailand | 472 |
| 03 | Taiwan | 514 |
| 04 | Korea | 513 |
| 05 | Japan | 504 |
| 06 | Hong Kong | 505 |
| 07 | 02 - 06 | |
| 08 | Mexico | 521 |
| 09 | Brazil | 515 |
| | Chile | 524 |
| | Peru | 510 |
| | Argentina | 552 |
| | Costa Rica | 524 |
| | Nicaragua | 497 |
| | Ecuador | 502 |
| | Panama | 504 |
| | Guatamala | 532 |
| | El Salvador | 512 |
| | Uruguay | 550 |
| | Venezuela | 493 |
| | Dominican Rep | 496 |
| | Paraguay | 498 |
| | Colombia | 511 |
| (10) | 08 - 09 | |

| Analysis group | | TOEFL Level* |
|---|---|---|
| 11 | Greece | 514 |
| | Turkey | 510 |
| | Cyprus | 499 |
| 12 | Pakistan | 524 |
| 13 | Malaysia | 559 |
| 14 | India | 556 |
| 15 | Nigeria | 553 |
| 16 | Singapore | 556 |
| 17 | Philippines | 594 |
| (18) | 12 - 17 | |
| 19 | France | 570 |
| 20 | Luxembourg | 600 |
| | Belgium | 585 |
| | Norway | 576 |
| | Sweden | 594 |
| | Germany (FR) | 583 |
| | Netherlands | 601 |
| | Spain | 552 |
| | Italy | 549 |
| | Austria | 583 |
| | Switzerland | 576 |
| | Denmark | 594 |
| | Iceland | 571 |
| | Finland | 582 |
| (21) | 19 - 20 | |
| (22) | Other nations | 550+ |
| (23) | Other nations | <550 |

* TOEFL Total means of U.S.-graduate-school-bound nationals tested during 1977-1979 (Wilson 1982a), ascribed to students from the respective countries as TOEFLEVL scores.

Exhibit A anticipates the clustering of certain countries for purposes of analysis. Note that, generally speaking, grouping of countries as in Exhibit A tends to control for native languages as well as characteristic level of TOEFL score.

Relative Verbal Performance Index. The RVPI is a measure of the discrepancy between observed verbal performance and expected verbal performance where expected performance is defined as that expected for U.S. examinees with given scores on quantitative admission tests, on which the performance of foreign examinees appears to be relatively unaffected by linguistic-cultural background factors (for example, Wilson 1984a, 1982c; Powers 1980). In deriving this index for the present study, a regression equation for predicting verbal from quantitative scores in an appropriate sample of U.S. GMAT examinees was used to determine the expected verbal score.

The following equation was employed:

$$V\text{-exp} = .562\ Q + 13.23.^{*}$$

By definition, for the U.S. GMAT examinees involved, the mean discrepancy between observed and expected GMAT Verbal is zero, and the standard deviation of the distribution of discrepancies is given by the standard error of estimate, which for the general sample was 6.87 points on the GRE verbal scale. As used in this study the RVPI is a T-scaled, linear transformation of the distribution of expected discrepancies (with mean of zero and standard deviation of 6.87) into a distribution with mean of 50 and standard deviation of 10. Thus, for example, RVPI = 50 indicates a verbal score exactly equal to that predicted for a U.S. examinee with a given quantitative score, RVPI = 40 indicates a verbal score that is lower than predicted by one standard error (10 points on the transformed scale equal 6.87 points on the GMAT scale), RVPI = 55 indicates a verbal score higher than expected by one half of a standard error of estimate, and all other RVPI values may be similarly interpreted.

Mean RVPI values for examinees classified by world region and by reported language of greatest fluency, and the corresponding GMAT score summary statistics as reported by GMAT (1982), are shown in Exhibit B.

## Means, Standard Deviations, and Intercorrelations of the Variables

Table 1 shows data availability and summary statistics for GMAT scores and other basic independent variables for the the total ESL and EPL samples; intercorrelations are shown in Table 2. Note that the EPL and ESL samples

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*This equation was based on means and standard deviations for 156,684 U.S. examinees tested during 1980-81 (GMAC 1982) as follows: Verbal mean = 28.29, quantitative mean = 26,79, verbal standard deviation = 8.23, and quantitative standard deviation = 8.06. ETS internal analyses indicate correlations between verbal and quantitative scores tend, typically, to be about .55. This coefficient was used in deriving the equation.

## Exhibit B

### GMAT Verbal, Quantitative and Total Score Summary Statistics and Relative Verbal Performance Indices by World Region and Primary Language

| World Region | MEAN<br>COUNT<br>STD DEV | Verbal | Quanti-tative | Total | RVPI* |
|---|---|---|---|---|---|
| U.S.A. | | 28.29<br>156684<br>8.23 | 26.79<br>156684<br>8.06 | 478.14<br>156684<br>99.25 | 50.0 |
| Canada | | 29.43<br>7759<br>7.78 | 29.83<br>7759<br>7.88 | 504.47<br>7759<br>90.97 | 50.8 |
| Southeast Asia | | 17.55<br>7681<br>7.47 | 30.01<br>7681<br>9.34 | 412.11<br>7681<br>96.39 | 31.7 |
| Pacific Islands | | 17.06<br>4627<br>7.54 | 31.80<br>4627<br>9.88 | 418.65<br>4627<br>94.05 | 29.6 |
| Europe | | 23.64<br>4526<br>9.39 | 29.29<br>4526<br>8.84 | 455.91<br>4526<br>109.13 | 41.2 |
| Southwest Asia | | 20.62<br>4056<br>8.96 | 27.59<br>4056<br>9.85 | 421.87<br>4056<br>115.72 | 38.2 |
| Africa | | 15.48<br>3643<br>7.49 | 19.46<br>3643<br>7.14 | 334.52<br>3643<br>89.63 | 36.9 |
| Cent&South America | | 18.51<br>2869<br>8.13 | 23.22<br>2869<br>7.94 | 380.20<br>2869<br>96.77 | 38.7 |
| E. Mediterranean | | 15.80<br>2386<br>8.42 | 24.76<br>2386<br>8.41 | 367.95<br>2386<br>100.49 | 33.5 |
| Mexico | | 17.75<br>725<br>7.81 | 24.24<br>725<br>7.63 | 380.43<br>725<br>92.44 | 36.7 |
| Australia | | 28.28<br>625<br>7.94 | 30.71<br>625<br>8.18 | 500.85<br>625<br>96.19 | 46.7 |
| No Response | | 24.98<br>18974<br>10.20 | 26.68<br>18974<br>8.68 | 451.47<br>18974<br>113.56 | 45.3 |
| COLUMN TOTAL | | 26.64<br>214555<br>9.13 | 26.99<br>214555<br>8.39 | 466.32<br>214555<br>104.83 | 46.9 |

Note: Data for candidates tested during 1980-81, from Graduate Management Admission Council (1982, Table 15)

* Relative Verbal Performance Index (Mean)

| Language | MEAN<br>COUNT<br>STD DEV | Verbal | Quanti-tative | Total | RVPI* |
|---|---|---|---|---|---|
| English | | 27.99<br>148165<br>8.41 | 27.04<br>148165<br>8.19 | 477.19<br>148165<br>101.26 | 49.4 |
| Spanish | | 23.19<br>6689<br>9.45 | 23.99<br>6689<br>7.93 | 421.67<br>6689<br>106.40 | 46.5 |
| French | | 27.26<br>6106<br>9.71 | 26.96<br>6106<br>8.34 | 470.96<br>6106<br>106.72 | 47.9 |
| Chinese | | 18.19<br>6450<br>7.44 | 32.21<br>6450<br>9.20 | 430.08<br>6450<br>92.36 | 30.9 |
| German | | 26.54<br>2821<br>9.44 | 26.78<br>2821<br>8.10 | 464.24<br>2821<br>107.08 | 47.5 |
| Indo-Iranian | | 17.63<br>2215<br>8.53 | 25.52<br>2215<br>9.18 | 386.59<br>2215<br>105.93 | 35.5 |
| Arabic | | 15.25<br>2016<br>8.03 | 26.38<br>2016<br>9.91 | 372.76<br>2016<br>103.08 | 31.4 |
| Korean | | 17.83<br>1505<br>7.23 | 34.34<br>1505<br>9.04 | 435.42<br>1505<br>92.83 | 28.4 |
| Japanese | | 17.05<br>995<br>8.56 | 30.94<br>995<br>9.04 | 413.31<br>995<br>94.68 | 30.2 |
| Greek | | 19.14<br>882<br>8.71 | 24.57<br>882<br>7.77 | 393.41<br>882<br>98.37 | 38.5 |
| Italian | | 24.65<br>837<br>8.41 | 23.97<br>837<br>7.61 | 433.17<br>837<br>97.66 | 47.0 |
| Hebrew | | 22.77<br>620<br>10.09 | 26.53<br>620<br>8.28 | 444.71<br>620<br>103.57 | 42.5 |
| Scandinavian | | 23.44<br>463<br>8.56 | 28.68<br>463<br>7.66 | 450.95<br>463<br>95.77 | 41.4 |
| Turkish | | 17.56<br>303<br>8.84 | 26.87<br>303<br>8.49 | 394.49<br>303<br>103.96 | 34.3 |
| Other | | 17.96<br>3986<br>8.92 | 24.20<br>3986<br>8.00 | 381.64<br>3986<br>95.05 | 37.1 |
| No Response | | 26.30<br>30502<br>9.48 | 26.49<br>30502<br>8.42 | 460.72<br>30502<br>107.92 | 47.4 |
| COLUMN TOTAL | | 26.64<br>214555<br>9.13 | 26.99<br>214555<br>8.39 | 466.32<br>214555<br>104.83 | 46.9 |

Note: Data for candidates tested during 1980-81, from Graduate Management Admission Council (1982, Table 28)

* Relative Verbal Performance Index (Mean)

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## Table 1

### Means and Standard Deviations for the Foreign ESL and Foreign EPL Samples on GMAT and Other Study Variables

| | ESL Students | | | EPL Students | | |
|---|---|---|---|---|---|---|
| Variable | N | Mean | S.D | N | Mean | S.D |
| GMAT-V* | 1767 | 24.1 | 7.8 | 157 | 33.5 | 8.2 |
| GMAT-Q | 1767 | 35.4 | 8.7 | 157 | 35.5 | 9.1 |
| GMAT-Total* | 1767 | 495.1 | 89.2 | 157 | 569.2 | 101.7 |
| VSSCOMP* | 1767 | 49.9 | 11.0 | 157 | 55.6 | 12.4 |
| SEX (M=1;F=0) | 1766 | 1.18 | 0.38 | 157 | 1.22 | 0.42 |
| YEAR OF BIRTH | 1766 | 55.8 | 3.6 | 157 | 55.5 | 4.6 |
| U.S.-UG*@ | 1690 | 0.23 | 0.42 | 142 | 0.35 | 0.48 |
| RVPI* | 1767 | 36.9 | 11.5 | 157 | 50.4 | 19.7 |
| TOEFLEVL* | 1762 | 529.6 | 34.2 | 157 | 605.8 | 34.7 |
| TOEFLTOT* | 1205 | 584.8 | 43.3 | 12 | 624.2 | 22.6 |
| YESTOEFL*# | 1767 | 0.68 | 0.47 | 157 | 0.08 | 0.27 |

*Differences in EPL and ESL means significant at $p < .003$.

@U.S. UG = 1, other = 0; #TOEFL score available = 1, not avail. = 0

## Table 2

### Intercorrelations of Study Variables in Total ESL and EPL Samples

| | GMAT V | GMAT Q | GMAT TOT | VSS COMP | SEX | BIRTH YEAR | U.S-UG | RVPI | TOEFL LEVEL | TOEFL TOTAL | YES TOEFL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GMAT-V | --- | .295 | .832 | .657 | -.033 | .209 | .093 | .806 | .303 | .648 | -.051 |
| GMAT-Q | .544 | --- | .756 | .909 | -.093 | .045 | -.262 | -.323 | -.094 | .126 | .228 |
| GMAT-Tot | .900 | .853 | --- | .946 | -.077 | .167 | -.083 | .357 | .155 | .526 | .086 |
| VSSCOMP | .791 | .944 | .977 | --- | -.088 | .124 | -.168 | .083 | .054 | .382 | .158 |
| SEX(M=1,F=2) | -.143 | -.244 | -.218 | -.235 | --- | .104 | .040 | .025 | -.095 | -.091 | -.046 |
| BIRTHYR | .058 | .182 | .129 | .156 | .064 | --- | .112 | .179 | .117 | .163 | -.010 |
| U.S.-UG@ | -.230 | -.233 | -.267 | -.259 | .083 | .062 | --- | .254 | -.062 | .103 | -.521 |
| RVPI | .784 | -.094 | .437 | .241 | .010 | -.066 | -.102 | --- | .358 | .552 | -.192 |
| TOEFLEVL | .486 | .279 | .446 | .395 | -.084 | .048 | -.200 | .370 | --- | .424 | .023 |
| TOEFLTOT | .434 | .444 | .502 | .497 | -.325 | .103 | -.024 | .187 | .003 | --- | # |
| YESTOEFL# | -.173 | -.046 | -.136 | -.102 | -.039 | .064 | -.065 | -.172 | -.219 | # | --- |

*Note*. Coefficients above the diagonal are for foreign ESL students; those below the diagonal are for foreign EPL students. Ns for coefficients involving TOEFLTOT do not exceed 1205 for the ESL sample and 12 for the EPL sample.

@U.S. UG = 1, other = 0; # 1 = TOEFL available, 0 = not available, correlation with TOEFL not meaningful.

differ significantly on all variables except GMAT quantitative, sex, and year of birth. ESL students performed as well on GMAT quantitative as did EPL students but had much lower menas on verbal and total, and on the English proficiency-related variables. Note that the mean of EPL students on RVPI was 50.4, indicating verbal performance like that of U.S. examinees with similar quantitative scores, while that of ESL students was 36.9, indicating verbal performance well below that expected of U.S. examinees with similarly high quantitative scores (13.1 T-scaled points below the expected mean of 50, or 1.31 standard errors of estimate).

Both samples were predominantly male in composition; only 18 percent of the ESL and 22 percent of the EPL sample were women. U.S. undergraduate origins were reported for about 23 percent of ESL and 35 percent of EPL students.

For perspective in evaluating the mean GMAT scores, the means for all U.S. examinees tested during 1980-81 were 26.8 and 28.3 for the verbal and quantitative measures, respectively (GMAC 1982). Both of the foreign student samples were very highly selected on quantitative ability, relative to the GMAT examinee population generally. Moreover, the verbal mean of the foreign ESL sample (24.1) was considerably higher than the mean (approximately 20.0) registered by all foreign nationals who took GMAT during the period 1977 through 1979 (Wilson 1982c, Powers 1981). Thus, the foreign ESL as well as the foreign EPL students in the study sample were highly selected on both verbal and quantitative ability, although the foreign ESL sample appears to have been somewhat more highly selected on quantitative ability than on verbal ability. Other points of interest include the following:

o Scores on TOEFL were available for 68 percent of the ESL sample; 12 EPL students (8 percent) also had TOEFL scores. From the intercorrelation table it may be seen that for the ESL sample, the presence or absence of a TOEFL score was more closely associated with undergraduate origin than with any other variable (point biserial coefficient of -.521 in the ESL sample)—absence of TOEFL was associated with U.S. origin of the bachelor's degree.

o The TOEFL Total mean for the 1,205 ESL students who did present scores was 584.8. For perspective, the TOEFL mean for all GMAT/TOEFL examinees tested during 1977 - 1979 was 553 (Wilson 1982b) while the mean for all U.S.-graduate-school-bound TOEFL examinees was only 511 (Wilson 1982a). Thus, the foreign ESL students in the sample were relatively highly selected in terms of English proficiency.

o For foreign ESL examinees, the correlation between GMAT verbal and quantitative scores is lower than that typically found for U.S. examinees ($r = .295$ as compared to $r =$ approximately .55) and that reported in Table 2 for foreign EPL examinees ($r = .544$).

o By inference from the point biserial coefficients reported in Table 2, among ESL students those with U.S. undergraduate origins tend to have somewhat higher GMAT verbal scores ($r = .093$ between U.S.-UG = 1, other = 0)) but lower quantitative scores ($r = -.262$ for the same variable).

- ESL students with U.S. undergraduate origins tended to have higher RVPI scores and TOEFL Total scores than others.

- ESL students without TOEFL scores scored higher on verbal and lower on quantitative than those with TOEFL scores; absence of TOEFL scores was associated with lower scores on RVPI.

- In the ESL sample, year of birth (inversely related to age) had low positive correlations with all variables except YESTOEFL—younger students more frequently were not required (by inference) to take TOEFL.

- Negative coefficients between SEX, GMAT scores, TOEFLEVL and TOEFLTOT indicate a tendency for women to have slighty lower average scores on these variables than men. However, women had slightly higher RVPI means than men.

## Means on Basic Study Variables, by Country

Some 140 different countries were represented in the study sample by one or more students (see Appendix A-1 for complete enumeration). However, 36 countries that were represented by 10 or more students accounted for slightly over 90 percent of the total foreign student sample (ESL plus EPL). Means on the study variables are shown in Table 3 for students from these 36 countries which are listed in descending order with respect to mean RVPI. The largest contingents came from Taiwan, India, Japan, Korea, Thailand, Mexico, Hong Kong, Malaysia, France, Canada, and Nigeria, all of which were represented by at least 50 students. The 157 students who were reported by schools as native speakers of English were drawn heavily from the Canadian, British, South African and Jamaican contingents. Note that the four contingents with highest GMAT quantitative means (Japan, People's Republic of China, Taiwan, and Korea) are among the five lowest contingents with respect to RVPI mean. In general, there are striking differences among the contingents in level of verbal performance relative to level of quantitative performance; and high quantitative means were obtained by contingents at all levels with respect to mean RVPI. Contingents also differ with respect to sex composition, proportion with U.S. undergraduate origin, mean year of birth, and other study variables. Contingents higher on RVPI tend to be higher on TOEFLEVL and TOEFLTOT as well as GMAT verbal.

## Preliminary Analyses of School-level Data

As a preliminary step, summary statistics (means, standard deviations, and missing data intercorrelations) for the variables described above plus the criterion variable (FYA) and the undergraduate GPA (UGPA) were computed, by school, for foreign ESL examinees only (a) to provide a basis for within-school standardization, and (b) to permit assessment of the level of simple GMAT/FYA and other correlations, especially TOEFLTOT/FYA and UGPA/FYA, in foreign-ESL samples that were heterogeneous with respect to all background variables.

## TABLE 3

### PROFILE OF MEANS ON INDEPENDENT VARIABLES, BY COUNTRY OF CITIZENSHIP

| COUNTRY | N | GMAT-V | GMAT-Q | GMAT-T | VSSCOMP (Q+.6V) | SEX (M=1/F=2) | BIRTHYR | USUG=1 | RVPINDEX | TOEFMN | TOEFTOT | YESTOEF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CANADA | 57 | 36.368 | 37.053 | 599.947 | 58.874 | 1.281 | 56.649 | 0.353 | 53.370 | 578.000 | 640.000 | 0.035 |
| GREAT BRITAIN | 40 | 34.800 | 37.825 | 592.250 | 58.705 | 1.150 | 55.800 | 0.176 | 50.454 | 540.000 | 583.400 | 0.125 |
| SOUTH AFRICA | 10 | 32.200 | 33.600 | 549.000 | 52.920 | 1.100 | 55.100 | 0.0 | 50.126 | 616.000 | 612.750 | 0.400 |
| PHILIPPINES | 38 | 30.632 | 31.053 | 519.211 | 49.432 | 1.342 | 56.421 | 0.061 | 49.927 | 594.000 | 642.241 | 0.763 |
| PAKISTAN | 30 | 28.300 | 30.333 | 499.767 | 47.313 | 1.100 | 56.133 | 0.667 | 47.120 | 524.000 | 618.375 | 0.267 |
| JAMAICA | 12 | 26.250 | 27.083 | 464.583 | 42.833 | 1.500 | 53.583 | 0.667 | 46.795 | 567.000 | 0.0 | 0.0 |
| ITALY | 13 | 30.846 | 35.538 | 547.692 | 54.046 | 1.000 | 56.692 | 0.091 | 46.568 | 552.000 | 604.000 | 1.000 |
| NORWAY | 15 | 28.933 | 33.200 | 518.867 | 50.560 | 1.133 | 56.467 | 0.467 | 45.697 | 576.000 | 613.778 | 0.600 |
| ARGENTIA | 13 | 29.769 | 35.538 | 547.615 | 53.400 | 1.077 | 55.000 | 0.083 | 45.001 | 552.000 | 600.833 | 0.923 |
| FED. RP. GERMANY | 22 | 27.500 | 32.773 | 506.818 | 49.273 | 1.182 | 56.682 | 0.227 | 43.960 | 583.000 | 608.917 | 0.545 |
| INDIA | 209 | 29.435 | 36.541 | 543.301 | 54.202 | 1.105 | 56.952 | 0.095 | 43.694 | 556.000 | 621.164 | 0.699 |
| VENEZUELA | 22 | 23.864 | 27.136 | 444.818 | 41.455 | 1.182 | 54.409 | 0.318 | 43.277 | 493.000 | 578.923 | 0.591 |
| ISRAEL | 12 | 30.417 | 39.000 | 563.583 | 57.250 | 1.167 | 53.167 | 0.200 | 43.111 | 543.000 | 595.000 | 0.333 |
| BRAZIL | 21 | 27.190 | 33.333 | 496.333 | 49.648 | 1.048 | 55.571 | 0.208 | 43.050 | 515.000 | 593.750 | 0.762 |
| SWEDEN | 13 | 26.692 | 32.692 | 501.231 | 48.708 | 1.154 | 55.769 | 0.091 | 42.850 | 594.000 | 622.091 | 0.846 |
| SINGAPORE | 25 | 29.120 | 37.920 | 556.400 | 55.392 | 1.200 | 55.320 | 0.261 | 42.107 | 567.000 | 635.923 | 0.520 |
| SPAIN | 10 | 26.500 | 33.600 | 503.000 | 49.500 | 1.000 | 57.900 | 0.300 | 41.827 | 549.000 | 574.000 | 0.600 |
| MALAYSIA | 65 | 24.369 | 30.108 | 467.092 | 44.729 | 1.277 | 55.985 | 0.625 | 41.582 | 559.000 | 599.400 | 0.462 |
| COLOMBIA | 26 | 23.308 | 28.731 | 448.077 | 42.715 | 1.115 | 55.423 | 0.346 | 41.163 | 511.000 | 563.526 | 0.731 |
| FRANCE | 64 | 27.813 | 36.797 | 531.453 | 53.404 | 1.094 | 57.094 | 0.054 | 41.122 | 570.000 | 603.635 | 0.813 |
| LEBANON | 15 | 26.200 | 34.533 | 501.933 | 50.253 | 1.000 | 57.467 | 0.417 | 40.626 | 501.000 | 607.833 | 0.400 |
| NIGERIA | 50 | 19.460 | 23.000 | 386.440 | 34.676 | 1.060 | 53.540 | 0.800 | 40.250 | 553.000 | 587.583 | 0.240 |
| NETHERLANDS | 26 | 25.692 | 34.308 | 501.923 | 49.723 | 1.115 | 57.269 | 0.200 | 40.072 | 601.000 | 601.222 | 0.692 |
| TURKEY | 13 | 27.231 | 37.077 | 528.385 | 53.415 | 1.308 | 57.462 | 0.462 | 40.046 | 510.000 | 580.000 | 0.308 |
| GREECE | 35 | 23.714 | 32.514 | 474.743 | 46.743 | 1.114 | 58.429 | 0.206 | 38.659 | 514.000 | 584.333 | 0.686 |
| HONG KONG | 77 | 25.597 | 36.481 | 514.610 | 51.839 | 1.247 | 57.403 | 0.740 | 38.155 | 505.000 | 579.929 | 0.364 |
| MEXICO | 79 | 22.709 | 32.392 | 463.747 | 45.473 | 1.051 | 56.401 | 0.056 | 37.740 | 521.000 | 575.443 | 0.886 |
| BELGIUM | 39 | 22.872 | 33.590 | 474.872 | 47.313 | 1.000 | 58.462 | 0.051 | 36.552 | 585.000 | 572.135 | 0.949 |
| CHILE | 21 | 23.571 | 34.905 | 484.905 | 49.048 | 1.095 | 56.476 | 0.053 | 36.495 | 524.000 | 582.167 | 0.857 |
| IRAN | 20 | 22.100 | 32.850 | 466.050 | 46.110 | 1.400 | 56.900 | 0.750 | 36.034 | 456.000 | 535.200 | 0.250 |
| PERU | 19 | 20.842 | 33.263 | 459.947 | 45.768 | 1.053 | 56.158 | 0.316 | 33.864 | 510.000 | 594.273 | 0.579 |
| KOREA | 146 | 23.301 | 42.027 | 527.788 | 56.008 | 1.041 | 54.027 | 0.079 | 30.274 | 513.000 | 576.265 | 0.801 |
| TAIWAN | 217 | 21.567 | 40.525 | 503.258 | 53.465 | 1.452 | 55.613 | 0.093 | 28.977 | 514.000 | 554.149 | 0.834 |
| THAILAND | 83 | 16.819 | 32.193 | 419.422 | 42.284 | 1.434 | 56.807 | 0.157 | 28.883 | 472.000 | 543.157 | 0.614 |
| P. R. OF CHINA | 18 | 21.167 | 40.111 | 498.667 | 52.811 | 1.333 | 54.500 | 0.056 | 28.733 | * | 560.667 | 0.833 |
| JAPAN | 158 | 21.184 | 41.032 | 507.133 | 53.742 | 1.064 | 53.766 | 0.076 | 28.005 | 504.000 | 581.692 | 0.842 |
| OTHER COUNTRIES | 191 | 24.178 | 30.010 | 464.613 | 44.517 | 1.152 | 55.047 | 0.361 | 41.383 | 493.000 | 590.470 | 0.435 |
| ALL COUNTRIES | 1924 | 24.894 | 35.399 | 501.133 | 50.314 | 1.181 | 55.816 | 0.236 | 38.035 | 493.000 | 585.234 | 0.633 |
| U.S. (1980-81) | 156684 | 28.29 | 26.79 | 478.14 | 43.764 | 1.372 | N.A. | N.A. | 50.000 | -- | -- | -- |

NOTE: DATA TABLED FOR COUNTRIES WITH N=10+ ONLY. DATA FOR BIRTH-YEAR AND UNDERGRADUATE ORIGIN NOT AVAILABLE FOR U. S., AND TOEFL ENTRIES ARE NOT APPLICABLE.

*DATA NOT AVBAILABLE FOR REPRESENTATIVE SAMPLE OF GRADUATE-SCHOOL BOUND TOEFL-TAKERS. FIGURE FOR TAIWAN MAY PROVIDE REASONABLE ESTIMATE OF GENERAL LEVEL (CF. GMAT SCORES AND TOEFL TOTAL). ENTRIES IN THE YESTOEF COLUMN INDICATE THE PROPORTION OF STUDENTS FROM A COUNTRY WITH TOEFL SCORES AND PERMIT INFERENCES REGARDING THE NUMBER OF CASES USED TO COMPUTE THE TOEFL TOTAL MEANS.

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Findings of the preliminary analyses are summarized below.*

(a) The median correlation between GMAT quantitative scores and first year GPA ($r = .30$) was the same as that observed for the 85 general samples of first-year students studied by the GMAC VSS during 1978-79 through 1980-81.

(b) The median correlation of GMAT verbal scores with FYA ($r = .16$) was lower than that for the 85 general samples ($r = .25$).

(c) The median correlation of VSSCOMP with FYA was .30; the median coefficient for GMAT Total with FYA was $r = .27$. The lower median for GMAT Total then for VSSCOMP ($Q + .6V$) may be understood most simply in terms of the lower median validity for GMAT verbal than for GMAT quantitative and the fact that GMAT contains more verbal items then quantitative items by a ratio of approximately 3 to 2. Thus, the less valid predictor (verbal) is weighted more heavily in GMAT Total than in VSS Comp.

(d) When samples were grouped according to size ($N < 20$, $N = 20$-$29$, and $N = 30+$), the median GMAT-Q/FYA correlations (but not GMAT-V/FYA or TOEFL/FYA correlations) varied inversely across sample-size categories ($r = .39$ for smaller, $r = .30$ for medium, and $r = .25$ for larger samples). GMAT-V/FYA correlations did not vary systematically with sample size ($r = .25$, .07, and .19 for smaller, medium, and larger samples). Larger samples were found to be more highly selected on GMAT quantitative ability then the medium or smaller samples (see supplementary figures in Appendix B).

(e) Twenty-five schools in the study had previously submitted data for general student samples to the GMAC VSS. Comparison of means for the earlier "all student" (principally U.S. citizen) samples from these schools with those of their foreign ESL students in the current study Appendix B.3) indicated that the quantitative means of the foreign ESL students typically were higher, and the average verbal scores were somewhat lower, then those for the student body generally.

(f) The median TOEFL/FYA correlation ($r = .22$), based on TOEFL-takers only, was slightly higher than the median GMAT-V/FYA correlation ($r = .16$) which was based on all foreign ESL students in the respective school samples.

(g) For 21 schools supplying UGPA, the median correlation between UGPA and FYA ($r = .12$) was lower than the GMAC-VSS 85-school median (.24.).

These median coefficients reflect trends in the comparative validity of the several predictors treated separately in school-level samples of foreign ESL students: correlations for verbal predictors lower than those typically reported for general samples; for GMAT quentative, correlations with FYA that are more comparable to those for samples of U.S. students; for UGPA, lower for foreign students, stemming undoubtedly from their diverse educational origins.

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*The findings summarized briefly in this section are reported in detail in a report prepared for distribution to participating schools. The report is attached as Appendix B, which includes some supplementary findings as well.

## Analyses Based on Pooled Within-School Data

Participating schools were not asked to provide data for U.S. citizens. Within each school, original scores on the continuous variables were subjected to a z-scale transformation using parameters for the foreign ESL students only—that is, the original scores were expressed as deviations from school foreign-ESL means in ESL standard deviation units, yielding distributions by school with means of zero and standard deviations of 1.0. To facilitate reporting, the z-scaled distributions were then T-scaled to form distributions by school with means of 50 and standard deviations of 10. Accordingly, all T-scaled variables in the total ESL sample, and in subsamples in which data are pooled for intact school samples, have means of 50 and standard deviations of 10 the means and standard deviations of the predictors. Data for the small numbers of foreign ESL students in each school sample were similarly scaled, using the foreign ESL parameters. The mean T-scaled (z-scaled) scores of foreign EFL examinees, therefore, indicate the average within-school deviations of their scores from the means of foreign ESL examinees, the general population of interest.* Pooled within-school data for various classifications of students were employed to test the following hypotheses:

1) GMAT/FYA correlations will be moderated by level of English proficiency—that is, the correlations between GMAT scores and FYA will tend to be higher in subgroups of foreign ESL students characterized by higher average levels of English proficiency than in subgroups characterized by lower levels of English proficiency as reflected by:

a) EFL vs ESL status
b) Higher vs lower scores on TOEFL Total (TOEFL scale)
c) Higher vs lower standing on the RVPI (original scale)
d) Higher vs lower TOEFLEVL scores (original scale).

2) The correlation between GMAT scores and FYA will tend to be higher in subgroups that are homogeneous with respect to country of origin and/or associated background variables than in subgroups that are heterogeneous with respect to these variables.

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*There may be differences by school in the degree of representativeness of the foreign ESL samples with respect to national origin and associated background variables, with corresponding effects n the means and standard deviations of the predictors. The average within-school standing of students from different countries on a given z-scaled predictor is not likely to correspond exactly with their average standing in terms of original scores on the predictor. This fact limits inferences regarding comparative performance of subgroups on the predictors, based on the z-scaled variables. For the data of this study there is a high degree of correspondence between the means of students by country on the original and z-scaled variables. For example, for 17 analysis groups, largely homogeneous with respspect to country, the rank-order correlation between average within-school standing and average standing on original GMAT-Q scores was rho = .86; for the RVPI index, the corresponding relationship was rho = .97.

3) The correlation between UGPA and FYA will tend to be higher in subgroups of students with U.S. undergraduate origins than for other students.

Regression analyses designed to assess the potential utility of TOEFL scores and the TOEFLEVL index as supplemental predictors of FYA for foreign ESL students were also completed.

Results of the preliminary analyses of distributions of school-level coefficients indicated that median GMAT-Q/FYA correlations were lower for larger, more selected samples, than in smaller, less highly-selected samples —due, by inference, to differential degrees of restriction of range on GMAT-Q as a result of primary selection. Accordingly, whenever feasible, analyses were replicated in subgroups of students defined in terms of the size of samples of which they were members in order to introduce a measure of control for the range-restriction effects.

More detailed discussion of grouping criteria, analytic procedures employed, and related matters is provided below.

EPL vs ESL Status as a Moderator Variable

For the analyses summarized in Table 4, students were classified according To EPL/ESL status, and by size of school-level sample. Larger schools were defined as those represented in the sample by 36 or more students; medium size schools were those represented by 22-35 students and smaller schools were those represented by less than 22 foreign-ESL students. The medians of the distributions of school-level GMAT-Q/FYA coefficients for foreign-ESL students classified by size of sample were somewhat higher than the pooled within-school values shown in Table 4. In evaluating this it should be noted that the sample-size classification criteria were not identical. More important is the fact that the school-level coefficients were based on samples differing considerably in size and the median is not sensitive to differences in the size of samples. However, the pooled within-school coefficients are exact equivalents of the weighted averages of the school-level samples involved. Given the typically lower GMAT-Q/FYA correlations in larger than in smaller school-level samples, the weighted averages of the school-level coefficients would be expected to be smaller than the medians of the corresponding distributions of school-level coefficients.

o GMAT/FYA coefficients were higher for EPL than for ESL students; in the EPL sample, without regard to school size, the V/FYA and Q/FYA coefficients and the V,Q/FYA multiple correlation were quite comparable to medians for the 85 GMAC VSS studies involving primarily U.S. students.

o For ESL students, the pooled within-school coefficients for GMAT verbal, quantitative, and combined scores, without regard to school-size category, were lower than the corresponding 85-school medians. Across the three sample-size categories, the correlation between GMAT-Q and FYA was lower in the larger, more highly selected samples than in the smaller, less highly selected samples.

## Table 4

### Pooled Sample Correlations of Selected Variables with FYA, by EPL/ESL Status and Size of School-level Samples

| Grouping variables | (N) | GMAT-V | GMAT-Q | V,Q | U.S.UG* | SEX* | YEAR OF BIRTH* |
|---|---|---|---|---|---|---|---|
| | | r | r | R | r | r | r |
| EPL sample** | 157 | .255 | .326 | (.362) | -.349 | .030 | .073 |
| Larger sch. | 86 | .133 | .418 | (.419) | -.295 | .011 | .075 |
| Medium sch. | 37 | .481 | .406 | (.537) | -.351 | .282 | .086 |
| Smaller sch. | 34 | .318 | .154 | (.319) | -.458 | -.043 | .105 |
| ESL sample | 1762 | .180 | .239 | (.289) | -.066 | -.030 | .050 |
| Larger sch. | 945 | .204 | .183 | (.265) | -.029 | -.084 | .096 |
| Medium sch. | 552 | .136 | .290 | (.314) | -.068 | .039 | .017 |
| Smaller sch. | 265 | .182 | .332 | (.365) | -.184 | -.015 | -.043 |

Note: V,Q is the best weighted composite of V and Q; the coefficient reported is the multiple correlation coefficient. For 85 general first-year MBA samples studied by GMAC VSS at ETS the median V,Q multiple correlation was .35; medians were .25 and .30, for V and Q, respectively. Larger schools were defined as those represented in the sample by 36 or more foreign ESL students; medium schools were those with 22 - 35 students; smaller schools were those with fewer than 22 foreign ESL students in the study.

*Negative coefficients for U.S.UG indicate mean FYA lower for U.S. undergraduate origins than for others; for SEX, positive coefficients indicate higher FYA means for women than for men, negative coefficients indicate the opposite; positive coefficients for BIRTH YEAR indicate a tendency for younger students to earn higher FYA than older students.

**T-scaled means were 53.1 (FYA), 61.2 (GMAT-V), 49.1 (GMAT-Q). Means for ESL students, by definition, were 50.0 and standard deviations 10.

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Such a pattern of inverse covariation of size of coefficients with sample size is not evident in the data for the small samples of EPL students. U.S. undergraduates had somewhat lower average FYA in both the EPL and the ESL samples, but the relationship was stronger in the EPL sample. Some tendency for younger students to earn higher grades than their older classmates is evident for both samples, but no consistent direction is indicated the slight sex differences in FYA means. The coefficients for these variables vs FYA are shown here primarily to permit assessment of age, sex, and undergraduate origin (U.S. vs. other) as correlates of FYA.

There is no a priori reason to expect a consistent pattern of association (e.g., negative or positive) between these variables and first-year performance across schools such as that which, on both theoretical and empirical grounds, is expected to obtain between GMAT scores and FYA. None of these particular personal or background variables was found to add significantly to the multiple correlation when stepped into a battery that included GMAT scores.

## Analyses of TOEFL and RVPI as Potential Moderator Variables

It is reasonable to believe that the GMAT scores correlate more highly with FYA for EPL than for ESL students because EPL students and U.S. citizens share similar linguistic, cultural, and educational heritages. The validity of GMAT scores of both EPL and U.S. test-takers is unaffected by English-proficiency related factors whereas the validity of scores for ESL students is likely to be lowered, invalidly, to some extent by factors associated with their diverse backgrounds, especially differences in English proficiency.

The potential value of TOEFL Total score (T-T) and the Relative Verbal Performance Index (RVPI) as moderators of GMAT/FYA relationships rests on the assumption that test validities for foreign ESL students classified according to score levels on these measures will tend to vary in much the same way as those observed for EPL vs ESL status.

For both the T-T and the RVPI analyses, classification according to level was accomplished by identifying scores which in a normal distribution would delineate the upper, middle, and lower thirds of the distribution. For TOEFL Total the sample values demarcating the classifications were 603 plus, 567-602, and < 567 for higher, medium, and lower proficiency categories. Very few students scored below 500 (see plot of TOEFL total vs GMAT verbal scores in Appendix C).

Examinees with a TOEFL total score of 603 are at approximately the 93rd percentile in the distribution of scores for U.S. graduate-school-bound TOEFL-takers, and the corresponding percentile for a score of 567 is approximately the 82nd; native English speakers tend to average above 600 on TOEFL (ETS 1981). Thus the average level of measured English proficiency in this ESL sample is high, relative to the average for all U.S.-graduate-school-bound TOEFL examinees. Considerable prior screening for English proficiency has taken place.

TOEFL scores were available for 1,205 students, and missing for 559. It seems reasonable to assume that the students without scores were screened for English proficiency by other means. For example, a relatively strong association obtained in this sample between U.S. undergraduate origin and the absence of a TOEFL score, suggesting that U.S. undergraduates may have been exempted from taking TOEFL in many instances.

A similar procedure was employed in classifying students according to the RVPI, available for all students. Higher, medium and lower scoring groups were delineated by scores of 42 plus, 32 - 41, and < 32, respectively. Students in the higher category have verbal scores less than one error of estimate below expectancy for U.S. GMAT examinees, those in the medium-score category have verbal scores below expectancy by between roughly one and two errors of estimate, while those in the lower category have verbal scores deviating from expectancy by roughly two or more errors of estimate, based on data for U.S. examinees.

Students in the respective English proficiency classifications were grouped by two sample-size categories—the medium and smaller samples for which data were shown in Table 4 were combined into a single smaller school-sample classification.

Pooled within-school correlation matrices were computed for all ESL students, and for larger and small sample-size classifications within the several proficiency groups. FYA was regressed on GMAT scores, and TOEFLTOT and TOEFLEVL were added to assess their potential contribution as supplementary predictors.

*TOEFL-related findings.* Table 5 shows zero-order correlation coefficients indicating the relationship of GMAT verbal and quantitative scores and total scores on TOEFL Total (T-T) and TOEFLEVL (T-L) for students in the three proficiency groups and for all students with T-T; coefficients are also shown for students without TOEFL. Means of the T-scaled variables are provided. These means indicate average relative within-school standing on the respective variables. Positive coefficients for T-L indicate a tendency toward higher FYA for students from countries whose nationals have higher average scores on TOEFL than for those from countries with typically higher-scoring nationals. Students in the higher T-T classification had substantially higher within-school standing on GMAT verbal than on GMAT quantitative, while for those in the medium T-T and lower T-T groups, the opposite was true. Standard deviations of the T-scaled variables (not shown in the table) were as follows for students in the higher, medium and lower T-T groups: verbal (9.2, 9.2, 8.7 for higher, medium, and lower groups); quantitative (10.1, 8.8, 9.9); T-L (10.1, 8.9, 7.8); and for T-T, the classificatory variable, (6.4, 8.7, 7.2). The only variable for which a relatively strong systematic decrease in variability occurred across proficiency categories was T-L (TOEFLEVL).

In Table 5, the underscoring indicates that for the designated predictor(s), the observed correlations with FYA increased steadily from lower to higher T-T classifications—e.g., for the larger school group, successively higher GMAT-V/FYA coefficients (.114, .128, and .247) were found for lower, medium, and higher T-T classifications. A consistent increase in GMAT/FYA

## Table 5

### Means and Correlations with FYA of Selected T-scaled Variables, By Level of TOEFL Score and Sample-size Category

| | | Means of T-scaled variables | | | | | Correlation with FYA | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Group/ Sample size | (N) | FYA | V | Q | T-L* | T-T* | V | Q | T-L | T-T |
| No TOEFL | | | | | | | | | | |
| Larger | (247) | 50.4 | 53.3 | 47.8 | 50.1 | — | .171 | .163 | .049 | — |
| Smaller | (312) | 49.4 | 51.2 | 47.6 | 50.5 | — | .110 | .341 | .017 | — |
| All | (559) | 49.8 | 51.1 | 47.7 | 50.3 | — | .140 | .267 | .030 | — |
| Higher T-T (603+) | | | | | | | | | | |
| Larger | (275) | 51.5 | 53.2 | 49.7 | 53.5 | 58.8 | .247 | .298 | .156 | .159 |
| Smaller | (164) | 50.8 | 55.3 | 49.8 | 55.9 | 59.7 | .282 | .307 | .112 | .100 |
| All | (439) | 51.3 | 54.0 | 49.8 | 54.4 | 59.1 | .254 | .301 | .137 | .136 |
| Medium T-T (567-602) | | | | | | | | | | |
| Larger | (239) | 49.0 | 46.8 | 52.5 | 47.8 | 47.2 | .128 | .176 | .142 | .100 |
| Smaller | (140) | 51.5 | 47.8 | 52.3 | 48.4 | 49.6 | .074 | .277 | .076 | .048 |
| All | (379) | 49.9 | 47.2 | 52.5 | 48.0 | 48.1 | .111 | .214 | .116 | .099 |
| Lower T-T (< 567) | | | | | | | | | | |
| Larger | (184) | 48.3 | 44.9 | 50.1 | 47.3 | 40.5 | .114 | .108 | -.020 | .198 |
| Smaller | (201) | 49.3 | 45.3 | 52.3 | 45.6 | 42.3 | .188 | .250 | .008 | .181 |
| All | (385) | 48.8 | 45.1 | 51.2 | 46.4 | 41.4 | .150 | .177 | -.012 | .193 |
| All T-T levels | | | | | | | | | | |
| Larger | ( 915) | All means = 50.0 | | | | | .214 | .196 | .147 | .205 |
| Smaller | ( 817) | All means = 50.0 | | | | | .189 | .271 | .082 | .124 |
| All | (1203) | All means = 50.0 | | | | | .204 | .227 | .119 | .172 |

*Note*. Coefficients underscored are those that increase steadily from lower to higher T-T classifications for the corresponding groups. Thus, for example, in samples from larger schools GMAT-V/FYA correlations increased consistently lower to higher T-T classifications.

* T-L (TOEFL Level—country means ascribed to citizens in the sample); T-T (TOEFL Total score). T-T classification is in terms of the TOEFL score scale.

correlation from lower to higher T-T for every subgroup is evident for GMAT-Q and TOEFLEVL, which was not thought of as a predictor whose relationship with FYA should be moderated by TOEFL Total. The sharply reduced TOEFLEVL/FYA relationship in the lower T-T subgroup is associated with a sharply reduced standard deviation for the predictor in that subgroup, due to selection that is incidental to direct selection of the subgroup on TOEFL—by inference, students in the lower T-T classification tend to come disproportionately from countries characterized by lower-scoring contingents of U.S.-bound students.

For the 439 students in the higher T-T classification, the observed GMAT/FYA correlations, for both the verbal and the quantitative measures, are comparable to typical coefficients in samples of U.S. students studied by GMAC VSS and are like those for the sample of foreign EFL examinees in this study (cf. Table 4). These results support the hypothesis that level of English proficiency as indexed by TOEFL tends to moderate GMAT/FYA relationships; by inference, in much the same way and for the same reasons that EFL vs ESL status, per se, moderates these relationships. For the present sample, the effect is pronounced only for students with very high TOEFL scores of approximately 600 or greater, a level attained by fewer than 10 percent of U.S. graduate-school-bound TOEFL examinees.

Some insight regarding the potential role of T-L and T-T as predictors of FYA is provided by the patterns of zero-order validity coefficients in Table 5: in the total GMAT/TOEFL sample, T-T and GMAT-V have roughly comparable validity, in the higher T-T sample, validity for GMAT-V is greater, but in the lower T-T sample, T-T has greater criterion-related validity than GMAT-V. The multiple regression results shown in Table 6 provide further evidence regarding this trend. Two analyses were run, one (A) with V,Q as the basic verbal/quantitative predictor set and the other (B) with T-T,Q as the basic set. In the TOEFL/GMAT sample without regard to T-T level, regression outcomes were strikingly similar in sets A and B; this was also true for the medium T-T classification. Weights for all predictors were significant and adding T-L and T-T led to a modest increase in the multiple correlation.

However, in the higher T-T subgroup, the weight for GMAT-V was significant but not that for T-T, whereas in the lower T-T subgroup, T-T became the contributing verbal predictor and the weight for GMAT-V was insignificant. The weight for T-L was significant in all but the lower T-T subgroup; this result may be explicable in terms of incidental range restriction on T-L due to direct selection on T-T, the classificatory variable. In the sample of students without TOEFL scores, the V,Q/FYA coefficient was $R = .287$; T-L did not make a significant contribution to prediction. The V,Q/FYA multiple was slightly higher than that obtained in either the medium or lower T-T classification.

From the patterns of verbal and quantitative means for the no T-T classification (Table 5), and the correlational results, it may be inferred that the no T-T group probably is somewhat below the higher T-T group, but higher than the other T-T groups, in average English proficiency.

The foregoing findings suggest that in general samples of students who have been screened on both GMAT and TOEFL, these measures are likely to have

## Table 6

## Supplemental Contribution of T-L and T-T to Prediction of FYA

| Group | (N) | Standard partial regression weight | | | | (R) |
|---|---|---|---|---|---|---|
| | | GMAT V | GMAT Q | T-L | T-T | |
| Higher T-T | (439) | | | | | |
| V,Q (A)# | | .224 | .276 | | | (.374) |
| V,Q,T-L | | .187 | .300 | .130 | | (.394) |
| V,Q,T-L,T-T | | .162 | .308 | .119 | .057* | (.377) |
| T-T,Q (B)# | | | .322 | | .175 | (.348) |
| T-T,Q,T-L | | | .338 | .143 | .130 | (.373) |
| Medium T-T | (379) | | | | | |
| V,Q (A) | | .092* | .206 | | | (.272) |
| V,Q,T-L | | .054* | .234 | .143 | | (.290) |
| V,Q,T-L,T-T | | .036* | .235 | .135 | .054* | (.291) |
| T-T,Q (B) | | | .214 | | .100 | (.236) |
| T-T,Q,T-L | | | .239 | .142 | .066* | (.273) |
| Lower T-T | | | | | | |
| V,Q (A) | (385) | .127 | .158 | | | (.217) |
| V,Q,T-L | | .128 | .156 | -.005* | | (.217) |
| V,Q,T-L,T-T | | .082* | .142 | -.017* | .148 | (.258) |
| T-T,Q (B) | | | .154 | | .172 | (.246) |
| T-T,Q,T-L | | | .153 | -.005* | .246 | (.246) |
| All T-T | | | | | | |
| V,Q (A) | (1203) | .193 | .218 | | | (.296) |
| V,Q,T-L | | .150 | .237 | .111 | | (.313) |
| V,Q,T-L,T-T | | .109 | .242 | .088 | .090 | (.321) |
| T-T,Q (B) | | | .238 | | .185 | (.293) |
| T-T,Q,T-L | | | .255 | .107 | .142 | (.308) |

# In Set A, GMAT-V is treated as the principal verbal measure, and in Set B, T-T (TOEFL total score) is treated as the principal verbal measure.

*Weight not significant, p > .05

generally comparable criterion-related validity. However, the relative validity of GMAT-V and TOEFL may tend to vary inversely with level of English proficiency. In ESL samples with high levels of acquired proficiency in English, GMAT-V may tend to be a more "psychometrically efficient" measure than TOEFL, whereas for for less proficient students, TOEFL may be the more efficient measure. (See Wilson 1982c, pp. 11 - 15, for a discussion of this proposition in the context of data for the general TOEFL/GMAT population).

*RVPI as moderator*. Classification of students according to RVPI resulted in the identification of three subgroups differing markedly in relative standing on verbal and quantitative (Table 7); T-scaled verbal means varied inversely and quantitative means varied directly with RVPI level. Both T-L and T-T means varied directly with RVPI level. Direct selection on RVPI leads to incidental range restriction on the other variables; for higher, medium, and lower RVPI classifications without regard to school size, standard deviations were as follows: verbal (9.4, 9.5, 8.7; quantitative (9.4, 9.5, 8.7); T-L (10.4, 9.9, 7.9; T-T (9.5, 9.4, 8.2). In evaluating the coefficients, it should be kept in mind that T-T scores were missing for 559 of the 1762 students included in the RVPI sample.

The correlations of GMAT and other predictors with FYA for higher, medium, and lower RVPI classifications (Table 7) are generally similar in pattern to those reported (Table 5) for comparable T-T classifications: GMAT/FYA and T-L/FYA correlations tended to increase from lower to higher RVPI, and T-T/FYA correlations were somewhat higher than GMAT-V/FYA correlations in the lower RVPI subgroup. However, there are some differences in results:

o In the T-T analysis, both verbal and quantitative correlations were relatively high in the higher proficiency group, but were considerably lower in both the medium and lower proficiency groups;

o In the RVPI analysis, GMAT-Q/FYA correlations, and GMAT-V/FYA correlations to a lesser extent, were relatively high in *both* the higher and medium RVPI classifications.

Table 8 shows selected results of regression analyses designed to assess the supplemental contribution of T-L and T-T by RVPI level. Using missing data regression procedures in order to include T-T as a supplemental predictor, in analyses without regard to school-sample size, T-T made a significant supplemental contribution in the Higher and Lower RVPI classifications and was found to have higher weight than GMAT-Verbal in these analyses; neither V nor T-T made a significant contribution to the equation for the Medium RVPI students. The missing data regression-procedures employed involved an assumption that the patterns of relationships for students without TOEFL and those with TOEFL are similar.

The overall pattern of differences in moderating results for analyses based on T-T levels (Table 5) and the analyses based on RVPI levels is highlighted by the multiple correlation coefficients for V,Q/FYA in the respective analyses: in the T-T analyses V,Q/FYA multipes were .374, .233, and .217 for higher, medium, and lower proficiency groups, respectively;for the RVPI

## Table 7

### Means and Correlations with FYA of Selected T-Scaled Variables, By Score-level on the RVPI and Sample-Size Category

| | | T-scaled means | | | | | Correlation with FYA | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Group | (N) | FYA | V | Q | TOEFL Level | TOEFL Total* | V | Q | T-L | T-T* |
| Higher RVPI (42+) | | | | | | | | | | |
| Larger | (332) | 51.1 | 58.6 | 45.5 | 54.1 | 56.6 | .235 | .330 | .101 | .206 |
| Smaller | (257) | 50.0 | 59.1 | 44.9 | 53.6 | 56.4 | .147 | .323 | .081 | .142 |
| All | (589) | 50.6 | 58.8 | 45.2 | 53.9 | 56.6 | .194 | .328 | .094 | .182 |
| Medium RVPI (32 - 41) | | | | | | | | | | |
| Larger | (306) | 49.7 | 49.1 | 49.7 | 49.5 | 49.1 | .222 | .268 | .102 | .114 |
| Smaller | (257) | 50.0 | 49.6 | 49.7 | 51.1 | 50.3 | .308 | .378 | .051 | -.022 |
| All | (563) | 49.9 | 49.3 | 49.7 | 50.2 | 49.6 | .263 | .317 | .080 | .064 |
| Lower RVPI (< 32) | | | | | | | | | | |
| Larger | (307) | 49.0 | 41.6 | 55.2 | 46.0 | 45.7 | .135 | .104 | .078 | .220 |
| Smaller | (303) | 50.0 | 42.6 | 54.6 | 46.0 | 45.6 | .175 | .301 | .035 | .209 |
| All sch | (610) | 49.5 | 42.1 | 54.9 | 46.0 | 45.6 | .158 | .199 | .056 | .214 |
| All levels | | | | | | | | | | |
| Larger | ( 945) | | All means = 50.0 | | | | .204 | .183 | .119 | .205 |
| Smaller | ( 817) | | All means = 50.0 | | | | .151 | .304 | .053 | .124 |
| All | (1762) | | All means = 50.0 | | | | .180 | .239 | .088 | .172 |

Note. Coefficents underscored are those that increase steadily from lower to higher RVPI levels for the corresponding groups. Thus, for example, the GMAT-V/FYA correlation increases steadily from lower to higher RVPI in samples from the larger schools.

*Correlations for T-T are based on smaller samples of TOEFL-takers within each group. By RVPI group, the "All students" percentages with TOEFL Total were 57.7 percent (Higher), 69.3 percent (Medium), and 77.5 percent (Lower). Classification was according to the Relative Verbal Performance Index as originally scaled.

## Table 8

## Selected Results of Multiple Regression Analyses
## by RVPI Level

| RVPI level/ Sample size | (N) | V,Q (R) | Add T-L (R) | Add T-T# (R) |
|---|---|---|---|---|
| Higher RVPI (total) | 589 | .331 | .339 | .364* |
| Larger | 332 | .340 | .351 | .377* |
| Smaller | 257 | .323 | .329 | .364* |
| Medium RVPI (total) | 563 | .323 | .334* | .336(b) |
| Larger | 306 | .272 | .290 | .291 |
| Smaller | 257 | .386 | .392 | .411*(b) |
| Lower RVPI (total) | 610 | .216 | .225 | .274* |
| Larger | 307 | .145 | .161 | .238*(a) |
| Smaller | 303 | .306 | .311 | .342* |

Note: Underscoring indicates that the sum of weights for the two added predictors is greater than the weight for GMAT-Verbal.

#TOEFL scores are missing for a number of individuals in each analysis (see note to preceding table).

* Weight of added variable is significant, $p < .05$

(a) Only the weight for T-T is significant.

(b) Weight for T-T is negative.

analyses corresponding multiples were .331, .323, and .216. Both the T-T and the RVPI analyses indicate that the English-proficiency related variables have some potential as supplemental predictors, particularly among subgroups with lower T-T or RVPI.

The observed differences in results reflect, perhaps largely, the effects of the added data for students without TOEFL, who typically had higher relative standing on GMAT-V than on GMAT-Q (see Table 5) and would, accordingly, tend to be disproportionately concentrated in the higher and medium RVPI classifications. By inference, the higher RVPI classification includes a large proportion of the higher T-T students (for whom GMAT-V has "normal" predictive validity) and the higher and medium RVPI groups would include a disproportionately high concentration of the students without TOEFL scores (for whom the validity of GMAT scores though attenuated somewhat, is still higher than typical for individuals in the lower T-T or RVPI categories).

To the extent that the foregoing is true, it seems reasonable to infer that if all students had TOEFL scores, the overall patterns of moderating effects for TOEFL and RVPI would tend to be comparable.

### TOEFLEVL and Country of Citizenship as Moderator Variables

Results of the foregoing analyses suggest that the classification of students by TOEFL scores or RVPI leads to substantial incidental sorting by country of citizenship—for example, the dispersion of TOEFLEVL scores) decreased steadily across the higher, medium, and lower proficiency groups, as did their correlations with FYA. This is consistent with the fact that (a) TOEFLEVL classifies students according to the performance on TOEFL (mean scores) of all U.S.-graduate-school bound students from their respective countries and (b) there are modest positive correlations between TOEFLEVL and TOEFLTOT (r = .424), and RVPI (.351). (See Exhibit A and Table 2).

It was expected (a) that GMAT/FYA correlations would tend to be higher for students with higher TOEFLEVEL scores than for students with lower TOEFLEVL scores—that is, for students from countries whose U.S.-bound nationals typically have higher TOEFL means than for students from countries with lower-scoring student contingents. It was also expected (b) that GMAT/FYA correlations would tend to be higher in samples that are homogeneous with respect to country of origin than in samples that are heterogeneous with respect to this variable; moreover, to the extent that the hypothesis (a) is valid, it would be expected (c) that in samples that are homogeneous with respect to country of origin GMAT/FYA correlations would tend to be higher in samples from countries with typically higher-scoring contingents than in countries with typically lower-scoring contingents.

*Evaluation of hypothesis (a)*. Students were classified according to TOEFLEVL (T-L) as either Higher (scores of 550 or greater) or Lower (<550). The Higher category included primarily students (N = 643) from European countries or countries in which English is an official language and/or an academic lingua franca at the level of higher education—for example, India, the Philippines, Malaysia, Nigeria, Singapore, the Caribbean, etc.; the lower classification included primarily students (N = 1,119) from Asian countries in which there is more limited exposure to English (e.g., Taiwan, Thailand, Korea, Japan), and students from Mexico, Central and South America, and the Mideast. Predictor/FYA coefficients for students classified by TOEFLEVL and by school-sample size are shown in Table 9.

Consistent with expectation, students in the higher T-L classification (N = 643), GMAT/FYA correlations (V/FYA = .200, Q/FYA = .368, V,Q/FYA = .382) were systematically higher than comparable coefficients (.134, .194, and .232) for students in the Lower T-L classification (N = 1,119). Using missing data procedures with the limiting assumption of similarity of the TOEFL-taking and non-TOEFL-taking subgroups, TOEFLTOT,Q/FYA multiples for the two TOEFLEVL subgroups without regard to school-sample size (coefficients not shown in the table) were .382 and .231, respectively, comparable to those for V,Q in Table 9; and it is clear from Table 9 that adding T-L and T-T to the V,Q composite did not lead to a potentially practical increment in the multiple correlation. GMAT/FYA relationships were lower in the larger sample-size category which included the more highly selected samples.

This particular classification scheme identifies a subgroup based on historical country-level data alone for which the GMAT/FYA multiple correlation is relatively high—comparable to the 85-school GMAC VSS median. Only about 36 percent of the total is in this subgroup. GMAT/FYA correlations for the remaining students are rather markedly lower. The within-school standard deviations were generally comparable for the TOEFLEVL classifications. The higher TOEFEVL subgroup had relatively higher within-school standing on verbal than on quantitative, whereas the opposite was true for the lower TOEFLEVL subgroup.

Evaluation of hypotheses (b) and (c). Analyses of GMAT/FYA relationships were conducted in 23 subgroups, the majority of which included citizens of a given country only. In a few instances, students from several countries that were judged to be similar in important respects were included in a given analysis group—for example, one group consisted of students from several Arabic-speaking, primarily Mideastern countries, another of students from a number of European countries, and still another included data for (largely) Spanish-speaking students from Central and South American countries (see Exhibit A for detail regarding the countries included in analysis groups that were heterogeneous with respect to country of citizenship).

Pooled, within-school correlations (GMAT/FYA and TOEFL/FYA), based on T-scaled variables, are shown in Table 10 for the respective analysis groups. Analysis groups marked by a double asterisk are those characterized by typically higher-scoring TOEFL contingents (TOEFLEVL = 550+); others tend to have contingents scoring below 550 (see Exhibit A). Means and standard deviations of raw and T-scaled scores (the latter reflecting relative standing within school) on all study variables for these analysis groups are provided in Appendix C.

Because of sample-size considerations, the VSSCOMP/FYA coefficient, rather than the multiple correlation coefficient, is shown to reflect the joint relationship of V and Q to the criterion—VSSCOMP is a standard composite (Q + .6 V), reflecting the ratio of the average of optimal weights

## Table 9

## Selected Predictor/FYA Correlations for Students Classified by TOEFLEVL

| TOEFLEVL/ Sample | (N) | GMAT Verbal r | GMAT Quant r | T-L r | T-T r | V,Q R | Add T-L R | Add T-T R |
|---|---|---|---|---|---|---|---|---|
| Higher T-L | 643 | .200 | .368 | -.022 | .124 | .382 | .382 | .387 |
| Larger | 322 | .184 | .337 | -.049 | .180 | .353 | .353 | .378* |
| Smaller | 321 | .207 | .401 | -.014 | .042 | .410 | .411 | .414 |
| Lower T-L | 1119 | .134 | .194 | .040 | .126 | .232 | .234 | .246* |
| Larger | 623 | .160 | .143 | .036 | .133 | .207 | .210 | .220 |
| Smaller | 496 | .101 | .258 | .046 | .124 | .280 | .281 | .298* |

Note: TOEFL (T-T) scores are missing for a number of students.
Higher T-L = 550+; Lower T-L = <550

* Weight for added variable significant, p <.05

## Table 10

### Correlation of Designated Predictors or Composite Predictors with FYA, Based on T-scaled Within-school Data: By Analysis Group

| Analysis group* | ( N ) | GMAT Verbal | GMAT Quant | VSS Comp | TOEFL | Total |
|---|---|---|---|---|---|---|
| | r | r | r | r | r | (N) |
| 01 Mideast | 61 | .137 | .338 | .379 | .045 | 27 |
| 02 Thailand | 83 | -.018 | .125 | .099 | .203 | 51 |
| 03 Taiwan | 216 | .018 | .149 | .141 | .164 | 181 |
| 04 Korea | 146 | .156 | .251 | .282 | .007 | 117 |
| 05 Japan | 158 | .171 | .262 | .307 | .228 | 133 |
| 06 Hong Kong | 77 | .049 | -.037 | -.013 | .045 | 28 |
| 02-07 | 680 | .110 | .154 | .186 | .152 | 510 |
| 08 Mexico | 79 | .139 | .278 | .268 | .203 | 70 |
| 09 S.America | 147 | .123 | .289 | .276 | .030 | 103 |
| 08-09 | 226 | .144 | .290 | .283 | .122 | 173 |
| 11 Greece-Turkey | 55 | .080 | .165 | .229 | .112 | 31 |
| 12 Pakistan | 29 | .099 | .294 | .315 | .014 | 8 |
| **13 Malaysia**** | **64** | **.052** | **.291** | **.288** | **.277** | **30** |
| **14 India**** | **204** | **.225** | **.416** | **.406** | **.074** | **144** |
| **15 Nigeria**** | **44** | **.167** | **.434** | **.427** | **.454** | **11** |
| **16 Singapore**** | **18** | **-.083** | **.433** | **.389** | **-.128** | **10** |
| **17 Philippines**** | **37** | **.057** | **.351** | **.359** | **.327** | **28** |
| **12-17**** | **396** | **.199** | **.387** | **.388** | **.130** | **231** |
| **19 France**** | **64** | **.181** | **.419** | **.407** | **-.017** | **52** |
| **20 Other Europe**** | **164** | **.131** | **.286** | **.268** | **.133** | **126** |
| **19-20**** | **228** | **.141** | **.320** | **.302** | **.098** | **178** |
| **22 Other 550+**** | **42** | **.431** | **.277** | **.381** | **.532** | **16** |
| 23 Other < 550 | 74 | .411 | .411 | .506 | .312 | 36 |
| Total ESL | 1762 | .180 | .239 | .284 | .172 | 1202 |
| Total EPL | 157 | .252 | .326 | N.A. | Not applicable | |

* Analysis groups are listed in generally ascending order with respect to TOEFL Level. See Exhibit A for TOEFLEVL (TOEFL means) for the countries in the respective analysis groups. Group 09 includes Central as well as South American countries; Group 11 includes Cyprus; Groups 22 and 23 are classifications based entirely on TOEFLEVL (550 or above, or less than 550) for countries not elsewhere classified.

**Countries whose U.S.-graduate-school-bound nationals typically score 550 or higher on TOEFL.

for V and Q in general samples of students based on studies previously conducted by the GMAC VSS for 25 of the schools participating in the present study. In several analysis groups, the standard composite of verbal and quantitative scores (Q + .6V) was less closely related to FYA than GMAT-Q indicative of the disparity between the (lower) V/FYA and the (higher)Q/FYA coefficient. Coefficients for GMAT Total, not shown in the table, were also typically lower than that for GMAT-Q alone. There are more verbal than quantitative items in the GMAT. Thus, the GMAT total score gives more weight to the verbal items, which tend to have lower validity in these samples, than to quantitative items, which tend to have higher validity. Similarly, VSSCOMP may tend to give too much weight to the verbal component. TOEFL-Total/FYA coefficients and the number of cases on which they are based are also shown in Table 10.

- GMAT-Q/FYA correlations by analysis group were higher than the corresponding total ESL-sample coefficient (r = .239) in all analysis groups except those composed of students from Thailand, Taiwan, Hong Kong, and Greece-Turkey-Cyprus; coefficients for the three Asian contingents were especially low.

- In all but four of the analysis groups, GMAT-V/FYA correlations were lower than that for the total ESL sample (r = .180); and with few exceptions, the GMAT-Q/FYA correlations were higher than the corresponding within-school coefficient for all ESL students.

Results for several combined analysis groups (groups 02 through 06, 08 through 09, 12 through 17, and 19 through 20) shown in the table, indicate that GMAT-Q/FYA coefficients were higher for students from countries with typically higher-scoring TOEFL-takers, than for students from countries with typically lower-scoring TOEFL-takers—for the respective summary groups, Q/FYA coefficients were .154, .290, .387, and .320; the corresponding GMAT-V/FYA coefficients were .110, .144, .199, and .141. Thus, the pooled within-school GMAT-Q/FYA coefficients were higher for students from European countries and from the several Asian countries in which English is an important academic language than for students from Mexico, Central and South America, Thailand, Taiwan, Korea, Japan, and Hong Kong.

Findings for the several combined analysis groups are consistent with findings reported above for higher and lower TOEFLEVL classifications that did not break out data by country. According to Hypothesis C, there should be a relatively clear tendency for the GMAT/FYA relationships to be higher within the respective TOEFLEVL classifications when country is controlled than when data are analyzed without regard to country. Such a tendency is not clearly evident in Table 10. For example, GMAT-Q/FYA coefficients for analysis groups composed of the Higher TOEFLEVL students (those marked by double asterisks) are roughly comparable to that reported earlier (Table 9) for the Higher TOEFLEVL classification of students—no systematic enhancement of the GMAT-V/FYA relationship due to control over country is evident for these analysis groups. However, except for the combined Asian samples (02 through 06), coefficients for other combined analysis groups were higher than those (V/FYA = .134, Q/FYA = .194) reported in Table 9 for students in the general TOEFLEVL < 550 classification.

Two major trends emerged in the findings involving moderating effects of the test and background variables. First, classification both by test measures of English proficiency and by country appeared to have a moderating effect, especially on GMAT-Q/FYA relationships; sorting by the test measures led to substantial incidental sorting by country, and vice versa. Second, control for country of citizenship, per se, had a moderating effect on Q/FYA correlations (these were somewhat higher than in the general sample), but V/FYA correlations, by country, were somewhat lower than the corresponding correlation in the total ESL sample. Such a pattern, which was not expected, suggests that the pattern of correlations between GMAT means and FYA means for students classified by country is different from the pattern of within-school GMAT/FYA correlations. Some related findings that shed light on these two trends are presented below.

## Related Findings

The moderator analyses involving classification by country did not take into account individual differences within countries on English proficiency-related variables, and the TOEFLTOTAL and RVPI analyses did not take country of citizenship into account. Some indication of the degree of incidental sorting on country that is involved in the classification of students according to the English-proficiency related test measures is provided in Figure 1.

The figure portrays graphically trends in the distributions of RVPI values for students in the analysis groups shown in Table 10, ordered from lower to higher (left to right) in terms of mean RVPI. The vertical bars in the figure represent the range of RVPI values included in the middle two-thirds of the original RVPI-score distribution of each contingent (not the T-scaled within-school distribution); the horizontal lines correspond to the RVPI values that were used to classify students into higher, medium, and lower RVPI subgroups for the analyses reported in Table 7. At the top of the vertical bar for each analysis group, V,Q/FYA correlations (the VSSCOMP/FYA coefficients from Table 10) are entered; at the bottom of each vertical bar, the TOEFLEVL index value (mean TOEFL score of U.S.-bound TOEFL-takers) is shown.

The lower RVPI classification clearly includes a disproportionate number of students from Taiwan, Japan, Thailand, Korea, and the Mideast while the higher RVPI classification includes disproportionate numbers of students from countries where English is an official or academically important language, or countries.

It may be seen that students from Hong Kong, who were classified with contingents from Thailand, Taiwan, Korea, and Japan in terms of TOEFLEVL, have substantially higher RVPI scores than the other three contingents—by inference, perhaps 75 percent of the Hong Kong students are in the medium and higher RVPI classifications, whereas 50 percent or more of those from the other Asian contingents designated were in the Lower RVPI category. Judging from their higher RVPI scores (which index higher GMAT verbal scores as well), and the fact that only 36 percent of the Hong Kong students presented TOEFL scores as compared to over 80 percent of those in the other three contingents,

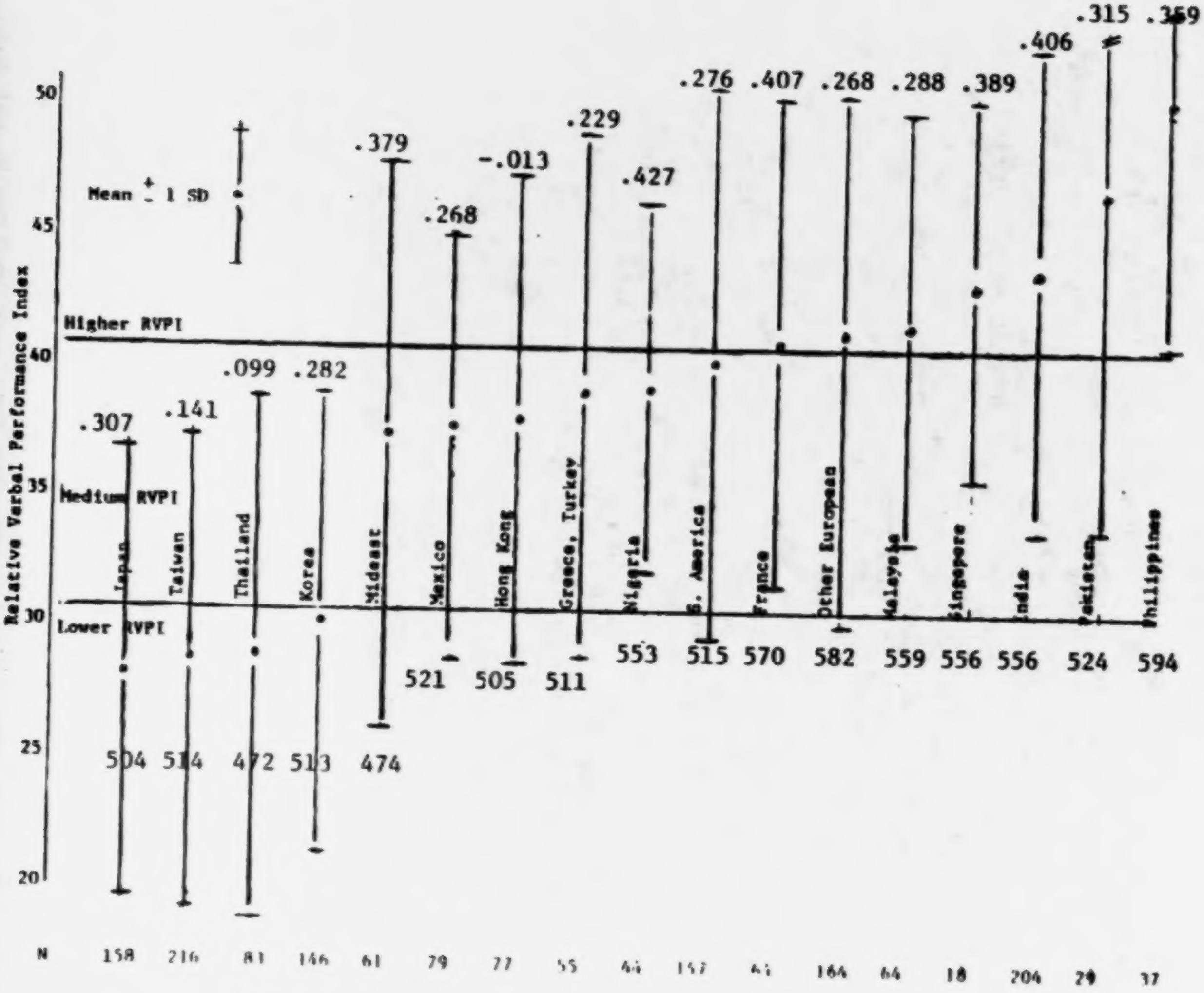

Figure 1. Trends in the national composition of higher, medium, and lower RVPI groups

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the average level of English proficiency of the Hong Kong sample presumably was higher than that of the other Asian contingents.

In any event, the variations in observed GMAT/FYA correlations among the four Asian contingents (analysis groups 02-06) cannot logically be attributed to differences in levels of English proficiency nor can the relatively low within-school correlations for the Hong Kong sample be explained solely in terms of "low English proficiency level." Selection-related considerations, as well as English proficiency related considerations that might tend to affect the level of GMAT/FYA correlations should be taken into account in evaluating the findings for these and other contingents of foreign ESL students. It may be recalled, for example, that these Asian contingents averaged above the 90th percentile on GMAT-Q.

This point is reinforced by the data in Table 11, which shows pooled within-school GMAT/FYA correlations for the four major combined analysis groups and for selected individual analysis groups, for students from schools represented by larger, more highly-selected samples of foreign students and schools represented by smaller, less highly-selected samples, respectively. Note that for analysis groups 02, 03, and 06 (Thailand, Taiwan, and Hong Kong), GMAT/FYA coefficients tend to be higher in the smaller, less-selected school-samples than in the large, more highly-selected samples.

It may also be determined from Table 11 that disproportionately high numbers of students from analysis groups 05, 08-09, and 19-20, were in the larger samples while disproportionately high numbers of student from the other analysis groups were in the smaller samples. Again, GMAT/FYA correlations may be influenced by selection-related as well as English-proficiency related factors.

*Correlation of T-scaled GMAT and FYA means.* As indicated above, control for country of citizenship, per se, resulted in Q/FYA correlations that were somewhat higher, but V/FYA correlations that were somewhat lower, than the corresponding correlations in the total ESL sample. This unexpected finding suggested that there were differences in the among-groups GMAT/FYA correlations for V/FYA and Q/FYA, respectively. More specifically, this result suggested the possibility of a higher degree of correlation between the mean T-scaled standing of the analysis groups on GMAT-V and FYA, than between the GMAT-Q and FYA means of the groups.

Figure 2 shows plots of T-scaled means (from Appendix C-1) for 17 analysis groups (all but the major combined groups in Table 10), on FYA and designated GMAT predictors: for GMAT-V/FYA (Plot A), GMAT-Q/FYA (Plot B), GMAT VSSCOMP/FYA (Plot C), and Total/FYA (Plot D). These plots indicate the degree of association beteen the average within-school standing of the respective groups on the designated predictors and their average standing in terms of FYA.

In evaluating the observed differences in T-scaled FYA means, it is important to recall that these means reflect average deviations from school-level FYA means for selected samples of foreign-ESL students. Although every school-level sample was heterogeneous with respect to analysis-group

## Table 11

### GMAT/FYA Correlations for Combined Analysis Groups, by Size of School-Sample

| | Larger (more selected) samples | | | | Smaller (less selected) samples | | | |
|---|---|---|---|---|---|---|---|---|
| Combined analysis grps* | N | GMAT-V | GMAT-Q | VSS COMP | N | GMAT-V | GMAT-Q | VSS COMP |
| 02-06 | 352 | .11 | .10 | .13 | 328 | .11 | .22 | .25 |
| 02 | 20 | -.33 | .08 | — | 63 | .07 | .14 | — |
| 03 | 95 | .00 | -.02 | — | 121 | .03 | .29 | — |
| 04 | 82 | .18 | .22 | — | 64 | .11 | .30 | — |
| 05 | 121 | .16 | .24 | — | 37 | .21 | .33 | — |
| 06 | 34 | .04 | -.20 | — | 43 | .13 | .20 | — |
| 08-09 | 169 | .10 | .26 | .24 | 57 | .27 | .37 | .42 |
| 12-17 | 141 | .13 | .31 | .30 | 255 | .20 | .44 | .42 |
| 19-20 | 173 | .16 | .36 | .34 | 55 | .08 | .21 | .20 |
| All ESL** | 945 | .20 | .18 | .25 | 817 | .15 | .30 | .33 |

* 02-06 (Thailand, Taiwan, Korea, Japan, Hong Kong); 08-09 (Mexico, Central and South American countries); 12-17 (Pakistan, Malaysia, India, Nigeria, Singapore, the Philippines); 19-20 (France, other European countries).

** Ns are greater than sum of column entries since not all analysis groups are treated in the table.

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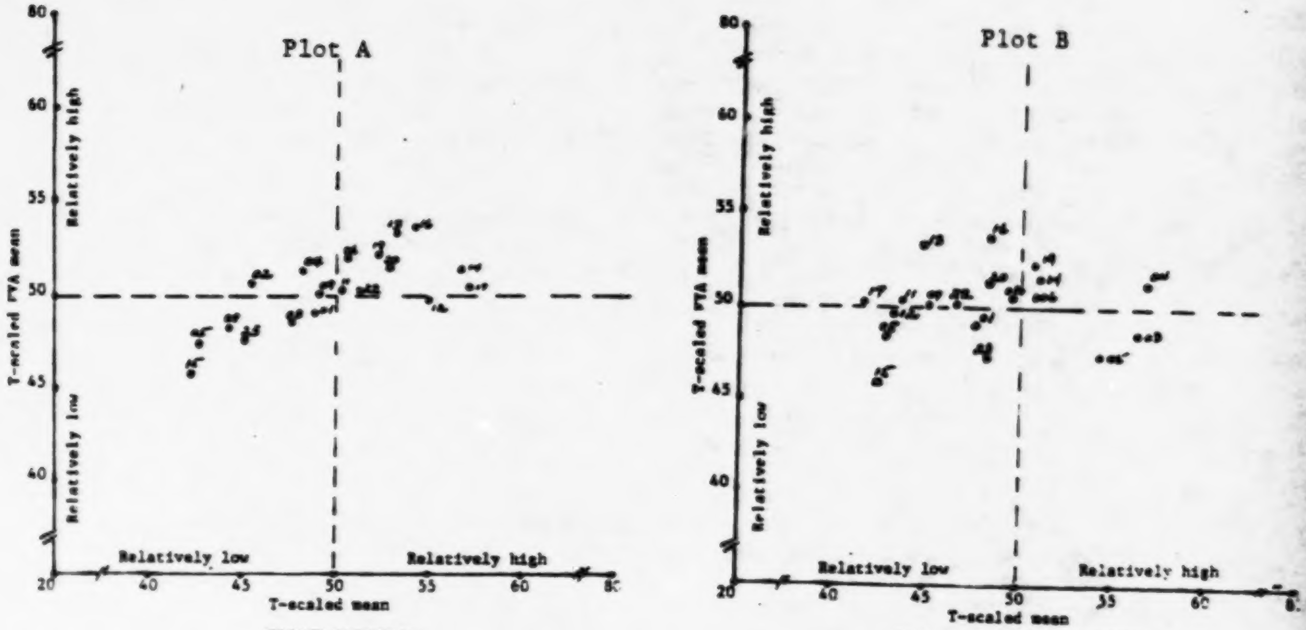
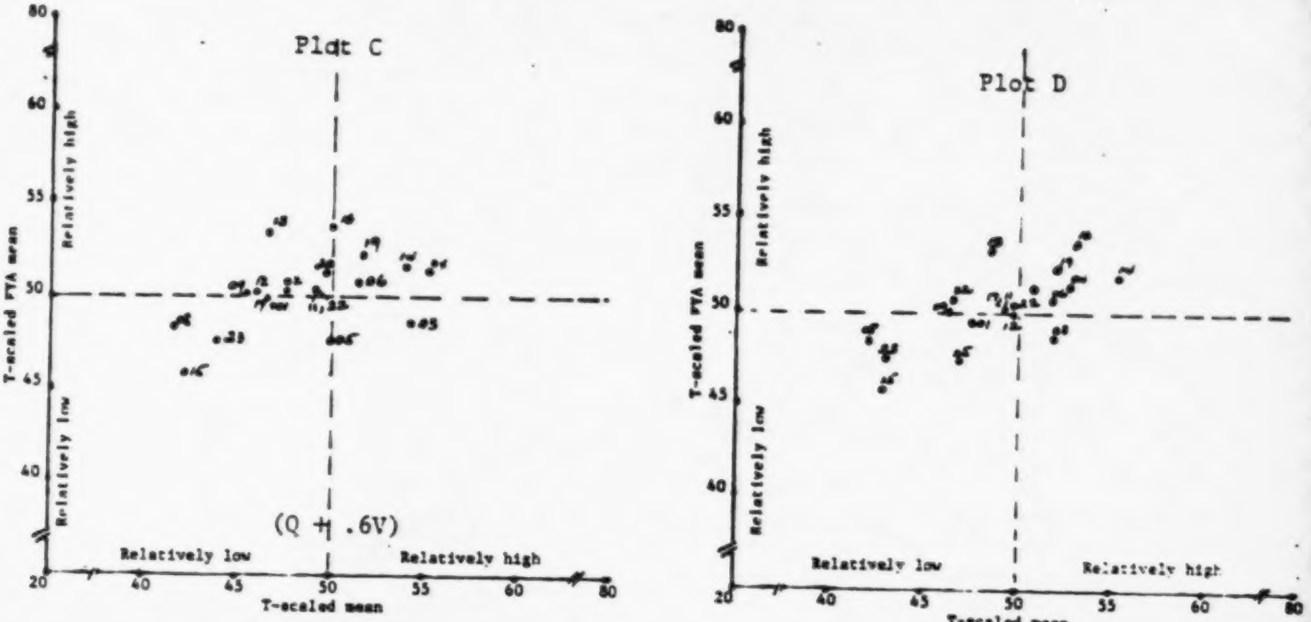


GMAT VERBAL

GMAT QUANTITATIVE



VSS COMPOSITE

GMAT TOTAL

Figure 2. Plots of T-scaled means on designated GMAT predictors and FYA for analysis groups (see Table 10)

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membership, all the analysis groups were not represented in every school sample, and the proportional representation of groups varied somewhat across schools. In the circumstances, small differences in mean FYA between groups should not be emphasized. Attention may properly be focussed, however, on general trends in the performance data, such as those portrayed in Figure 2.

- o From Plots A and B, it may be inferred that the average within-school performance (mean T-scaled FYA) of the respective analysis groups tended to correspond more closely with their average within-school (relative) standing on GMAT-Verbal, than with their relative standing on GMAT-Quantitative.

- o In Plots C and D, it may be seen that mean T-scaled GMAT Total tended to correspond somewhat more closely with mean T-scaled FYA than did mean T-scaled VSSCOMP; verbal items are more heavily weighted in GMAT Total than in VSSCOMP, so this finding is consistent with the pattern of findings in Plots A and B.

It appears (a) that individual differences in FYA within the respective analysis groups are more closely associated with GMAT quantitative than with GMAT verbal, but (b) that for analysis-group differences, the opposite is true —mean differences in T-scaled FYA were associated more closely with differences in T-scaled verbal means than with differences in T-scaled quantitative means. The fact that the GMAT-V/FYA correlation was higher in the total ESL sample (heterogeneous with respect to country of origin) than in the respective analysis groups (relatively homogeneous with respect to country) thus appears to be explained, statistically, by a relatively strong correlation between the T-scaled verbal and FYA (criterion) means of the respective analysis groups. In evaluating this result, it is useful to recall that the variable TOEFLEVL, which was formed by ascribing to students the TOEFL means of U.S.-graduate-school-bound TOEFL-takers from the respective countries, contains significant FYA-related variance—it was positively correlated with FYA in nationally heterogeneous samples. TOEFLEVL was thought of as reflecting differences in "richness of English language background" for students from different countries.

This apparently anomalous pattern of results is understandable, assuming the tenability of the following propositions:

a) Differences among the analysis groups in average performance on the GRE verbal measure tend to reflect average differences in level of developed proficiency in English, as much as (in addition to) differences in level of developed verbal reasoning ability, which the verbal test measures in samples of U.S. students. This may tend to be true as well for individual differences in verbal test performance within the respective analysis groups.

b) The differences in English proficiency that affect verbal test performance also affect academic performance.

In developing this rationale, it was reasoned that within the respective MBA programs, which include students from different countries (analysis groups), student performance is judged without regard to their national origin. In carrying out the full range of academic activities characteristic of the first year of study—involving within-classroom interaction, performance on periodic examinations written under time constraints similar to those imposed by standard tests, and written exercises outside the classroom—students with high quantitative ability but low English proficiency are at a competitive disadvantage vis a vis their counterparts with richer English language backgrounds and greater English proficiency, and their relative academic productivity suffers accordingly. Thus, students from countries whose U.S. bound nationals typically exhibit lower levels of English proficiency (as indexed by lower average scores on both GMAT verbal and TOEFL, for example), tend to receive lower FYA in MBA programs than students in the typically more proficient groups (country contingents) even though the latter may have lower average quantitative ability. Put simply, a variable like language may affect performance on both the predictor and the criterion variable, leading to patterns of predictive relationships that cannot be explained in terms of the construct which the test is designed to measure.

The foregoing line of reasoning also helps to explain both the low relationship between T-scaled means of the analysis groups on GMAT quantitative and FYA, and the finding that the GMAT-Q/FYA correlation in the total ESL sample (heterogeneous with respect to national composition) was lower than the corresponding coefficients within the respective analysis groups (country contingents of students with similar English language backgrounds). Both of these findings appear to be explained primarily by the fact that, on the average, the FYAs of students in national contingents characterized by high quantitative ability, but low English proficiency, tended to be more consistent with their level of English proficiency (as indexed by their low verbal scores) than with their high average scores on the GMAT quantitative measure. When data are analyzed by country (analysis group) this inconsistent predictor-criterion covariance is eliminated.

## Undergraduate Origin as Moderator of UGPA/FYA Relationships

Undergraduate GPA (UGPA) was provided for only 564 of 1,762 foreign ESL students from 22 of the participating schools. Students with UGPA were classified according to undergraduate origin (U.S. vs other) and school-sample size. About 28 percent had attended a U.S. school. Some 71 percent (402 of 564) of all students with UGPA were in the larger, more highly selected samples; 63 percent of those with U.S. undergraduate origin as compared to 74 percent of those with international undergraduate origins were in the more selected samples.

Consistent with logical expectation, UGPA/FYA correlations were much higher for students with U.S. origins than for those with diverse international origins.

- o In analyses involving data for 157 students with U.S. UGPAs, the UGPA/FYA coefficient was .262; the V,Q/FYA multiple was .180, and adding UGPA resulted in a multiple correlation of r = .324.

- For 407 non-U.S. UGPAs, the corresponding coefficients were r = .013 (UGPA/FYA), R = .264 (V,Q/FYA), and R = .266 (adding UGPA).

## Recapitulation

This study was designed to explore the effect of selected test and background variables on the pooled within-school relationship between GMAT scores and FYA, and to assess the potential role of selected TOEFL-related variables as supplemental predictors of FYA for foreign students.

GMAT/FYA correlations were found to be moderated by EFL vs ESL status, per se—for the small sample of students whose reported native language was English (N = 157), GMAT/FYA coefficients (V/FYA, Q/FYA, and V,Q/FYA) were .255, .327, and .362; comparable coefficients for the basic foreign ESL sample were .180, .239, and .289 (see Table 4).

In the foreign-ESL sample (N = 1,762) moderating effects on GMAT/FYA correlations were found when students were classified according to individual differences on two English-proficiency related measures, namely, scores on TOEFL and the Relative Verbal Performance Index (RVPI).

In analyses involving 1,203 foreign ESL students with scores on TOEFL, GMAT-FYA coefficients (both GMAT-V and GMAT-Q) were relatively high (comparable to typical coefficients observed in studies involving samples of U.S. MBA students) in the subgroup (N = 439) scoring 603 or higher, but not in two lower-scoring subgroups (Table 5).

In regression analyses based on data for the GMAT/TOEFL sample, TOEFL Total score (T-T) and TOEFLEVL (T-L) were found to have significant weights when treated as additional predictors in a battery that included GMAT-V and GMAT-Q (Table 6). In the higher-scoring T-T sub-sample, the weight for GMAT-V surpassed that for TOEFL Total, but in the lower-scoring T-T subgroup, TOEFL Total rather than GMAT-V was the primary verbal predictor in the battery. When TOEFL Total was substituted for GMAT-V as the primary verbal predictor, multiple correlations with the FYA criterion were quite comparable in the total GMAT/TOEFL sample; for students with lower T-T scores, the T-T,Q,T-L/FYA multiple (R = .246) was higher than the V,Q,T-L multiple (R = .217).

When students were classified according to RVPI level, GMAT/FYA coefficients were relatively high in the two higher RVPI-level classifications representing 1,152 of 1,762 ESL students (Table 7), and relatively low in the lower RVPI subgroup, trends consistent with hypothesis.

In the higher and medium RVPI classifications, GMAT-V/FYA coefficients were somewhat lower than those observed for the higher-scorers on TOEFL or for the foreign EFL sample. Using missing-data regression procedures (with the limiting assumption of similarity of TOEFL-taking and non-TOEFL-taking students), findings (Table 8) regarding the supplemental contribution of TOEFL and TOEFLEVL were generally similar to those in the basic GMAT/TOEFL sample (including only students with both scores).

GMAT/FYA correlations were found to be moderated when students were classified according to TOEFLEVL, as higher (T-L = 550+) or lower (T-L <550). As hypothesized, for students in the higher TOEFLEVL classification (from countries whose TOEFL-taking nationals average 550 or higher), V, Q, and V,Q correlations with FYA were higher (.200, .368, and .382, from Table 9) than the corresponding coefficients for students in the lower TOEFLEVL subgroup (.134, .194, and .232 for V, Q, and the V,Q composite, respectively).

Students were classified into 23 analysis groups, the majority of which were homogeneous with respect to country of citizenship. The GMAT-Q/FYA relationship was moderated this classification scheme for all but four analysis group (Table 10).

GMAT-Q/FYA correlations were higher for students from European countries and from several countries in which English is an important academic language (India, the Philippines, Malaysia, for example), than for students from Mexico, Central and South America, and from Asian countries in which English is not a widely-used academic language (e.g., Taiwan, Taiwan, Korea, and Japan).

Contrary to expectation, GMAT-V/FYA correlations for students classified by country tended to be lower than the corresponding coefficient in the total ESL sample (Table 10). This unexpected outcome appears to be accounted for, statistically, by a related finding (Figure 2), namely, that the T-scaled FYA means of analysis groups were more closely associated with their T-scaled means on GMAT verbal (the less valid predictor) than with their T-scaled means on GMAT quantitative (the more valid predictor). These results are understandable if it is assumed that differences among the analysis groups in average scores on GMAT verbal tend to reflect group differences in English proficiency that affect both verbal test performance and performance in MBA programs.

Analyses of moderating effects by TOEFLEVL and by country of citizenship did not take into account individual differences among students with respect to level of English proficiency as indexed by TOEFL Total scores or the RVPI. And, analyses of GMAT/FYA correlations in subgroups defined in terms of the two test variable did not consider country of citizenship. However, sorting by country of citizenship results in substantial incidental sorting on the English-proficiency (test) variables, and vice versa (Figure 1).

GMAT/FYA coefficients were especially attenuated in samples of students from several countries (e.g., samples from Thailand, Taiwan, and Hong Kong) whose U.S-bound TOEFL candidates typically score well below 550. Based on supplementary analyses (Table 11), both selection-related and English-proficiency related factors need to be considered in an explanatory rationale for these findings.

UGPA is a very important supplemental predictor for U.S. students. However, for foreign ESL students potentially useful UGPA/FYA correlations were found only in data for students reported to have graduated from a U.S. undergradute institution (following Table 11). Although UGPA was reported for ESL students by only 22 schools, the results are believed to be generalizable, due to the strong logical expectation that UGPA/FYA relationships should be lower for students with diverse, international undergraduate origins than for those who completed their undergraduate work in the United States.

## Discussion

The use and interpretation of the GMAT scores presented by foreign ESL students is complicated by the varied linguistic-cultural backgrounds of the students. There are differences among students, by country, with respect to characteristic background-patterns of English language acquisition and usage —that is, differences in timing of initiation, amount, duration, intensity, variety, and overall quality of students' English-language involvement. These differences, and related linguistic-cultural variables, make for important differences, by country, in the functional ability of U.S.-bound students to perform English language verbal tasks of the type represented by GRE verbal items.

Judging from the findings of this study, differences in functional ability tend to affect performance in the MBA program as well as performance on GRE verbal test items: the relative first-year within-school standing (mean T-scaled FYA) of foreign students by country of citizenship was relatively closely associated with their relative standing (T-scaled mean) on GMAT verbal, not with their relative standing on GMAT quantitative, which was systematically more valid as a predictor of FYA within various classifications of students.

Performance on GMAT quantitative does not appear to be affected by level of English proficiency. Very high average levels of ability to perform the tasks represented by GMAT quantitative items are commonly exhibited by foreign students with limited English-language backgrounds. This measure appears to maintain its construct validity across linguistic-cultural boundaries.

However, in samples of foreign ESL students, the GMAT verbal section (like TOEFL) appears to be measuring differences in the acquired functional ability to perform English language tasks (English proficiency) as much as (in addition to) English-language verbal reasoning ability, the test-construct. The amount of test-construct-related vs English-proficiency-related variance in the GMAT verbal-score distributions of students from different countries, by inference, is largely a function of the extent to which, by virtue of their respective heritages (linguistic and cultural) and patterns of English language acquisition and usage, the respective student groups tend to approach native levels of fluency in English. In this study, GMAT-V/FYA correlations like those typically reported for samples of first-year MBA students by the GMAC VSS were found only for EPL students (largely from native-English speaking countries) and for students with exceptionally high scores on TOEFL (over 600).

Although observed differences in quantitative score means for students by country, as well as score differences for individuals without regard to country, appear to be reflecting, primarily, valid differences in levels of developed quantitative reasoning ability, the relative standing of various country contingents in terms of first-year MBA performance (mean T-scaled

FYA), tended to correspond with their relative standing on the GMAT verbal measure (which by inference indexes differences in English language background and proficiency as much as [in addition to] differences in verbal reasoning ability).

To the extent that average differences in FYA for students classified by country are affected by differences in "English proficiency," questions are raised regarding the interpretation of observed differences in the average first-year grades of students from different countries. Differences in mean FYA may reflect quite accurately characteristic differences in the manifest behavior and academic productivity of students in the respective national groups. However, students who are members of national groups with relatively low average facility at English language verbal-processing may tend to be hampered in their ability to "show what they know," based on normal evaluational procedures, relative to their counterparts with richer English language backgrounds and correspondingly greater functional English-language facility. Given the foregoing interpretive rationale, questions may be raised regarding the "meaning" of average differences in FYA among groups of students representing national groups with characteristically different levels of English proficiency—such differences should be interpreted with caution. The "meaning" of FYA-differences among students with common linguistic-cultural heritages (e.g., from the same country) is not at issue here. The ambiguities in meaning alluded to are those associated with the interpretation of average differences in FYA for national groups of foreign students, especially between those characterized by atypically high average quantitative scores and low average verbal scores (with lower average English proficiency) vs those with relatively high levels of English proficiency (who tend to earn better grades, notwithstanding lower levels of quantitative ability).

Foreign ESL students with very high quantitative ability but low English proficiency may acquire more program-related knowledge, skills, and understandings than they are able to exhibit through their classroom participation, performance on examinations, and written work—as typically evaluated by the faculty. It would be useful, on an exploratory basis, to employ more intensive, and potentially more sensitive, personal assessment procedures to evaluate students' grasp of concepts, understandings, and the like.

These findings suggest that admission practices that favor "otherwise qualified" foreign applicants from countries whose ESL-nationals typically exhibit high levels of developed proficiency in English, over those from other countries, might result in improved levels of performance of enrolled foreign students on the FYA criterion. Membership in a particular group may provide information having predictive utility beyond that provided by measures of individual performance. For example, TOEFLEVEL, a variable employed in this study as a supplementary predictor of FYA (based entirely on historical country-level data—mean TOEFL scores of U.S.-bound nationals, ascribed to students from each country) added significantly to prediction of FYA when included in a battery with GMAT-V, GMAT-Q, and individual scores on TOEFL. Questions of policy are beyond the scope of this paper. However, there are important issues of equity involved in the use, in selective admission, of predictive background information based solely on group membership.

## Implications for Prediction

The primary aim of this exploratory study was to assess the potential role of selected test and background variables as moderators of the relationship between GMAT scores and first year performance in samples of foreign students. Such an assessment was thought of as constituting a needed first-step in the development of operational GMAT prediction-systems for foreign students.

A major implication of the findings is that a set of subgroup prediction systems for prospective foreign ESL students is likely to be more effective than any general system. GMAT/FYA correlations have been shown to be higher, as hypothesized, for subgroups of students characterized by richer English language backgrounds and higher levels of English proficiency than for those with more limited English backgrounds as indexed both by their national origins and their performance on English-proficiency-related test variables.

Classification of students by country of citizenship appears to have promise as the basis for a moderated system. Based on the findings of the present study, most of the moderating effect associated with country of citizenship might be realized by a classification scheme like that outlined, illustratively, below:

Group A: Students from native English-speaking countries (prediction rules developed for U.S. citizens might be applicable);

Group B: Students from non-native English speaking countries whose U.S.-bound students typically exhibit relatively high levels of English proficiency: e.g., students from West-European societies whose linguistic-cultural heritages are similar to those of U.S. students; students from Asian and African countries in which English is an official language and/or an academic lingua franca, especially in higher education (e.g., India, Singapore, Malaysia, Hong Kong, Philippines); countries for which TOEFLEVL typically is 550 plus.

Group C: Students from countries without a strong academic English-speaking tradition, whose heritages (linguistic, cultural, and educational) are moderately similar to those of U.S. students: e.g., students from South and Central America, eastern Europe, Greece, Turkey, Cyprus; countries with TOEFLEVL of 525 or higher, that are not elsewhere classified; countries for which TOEFLEVL typically is less than 550, but greater than 525.

Group D: Students from countries with a very limited English-speaking tradition, whose linguistic-cultural heritages are not similar to those of U.S. students: e.g., students from Taiwan, the Peoples' Republic of China, Japan, Thailand, Korea, and Asian countries not in Group B, above; students from Arabic-speaking countries; countries not elsewhere classified with TOEFLEVL less than 525; for Group D, TOEFLEVL typically is below 525.

Classification by country (a) introduces direct control for differences in relevant cultural, linguistic, and educational background variables, nested in countries of citizenship, that are controlled only indirectly by classifying students according to score levels on the test variables and (b) results in substantial incidental sorting on the English proficiency-related test variables. For example, students in Group D were generally quite low on the RVPI; however, Arabic-speaking students, also placed in Group D, had moderately high scores on this index. Consideration of the mean test performance of student-nationals might improve the placement of particular countries in any such classification.

Alternatively, a classification scheme based solely on the test variables might provide the basis for a moderated system; classification according to score-level on the RVPI, or TOEFL, results in substantial incidental sorting on country.

- o RVPI appears to be promising as the basis for subgrouping. It is derived from GMAT scores and it is indexed to the general population of U.S. GMAT examinees. For the data under consideration in this study, GMAT-Q/FYA correlations exceeding r = .30 (typical for samples of U.S. students), were found for students with higher and medium RVPI values (two-thirds of all ESL students); for the remaining students GMAT/FYA correlations were relatively low (r = .16, and r = .20 for V/FYA and Q/FYA, respectively). Most of the lower-RVPI students had GMAT verbal scores that were more than two standard errors of estimate lower than would be expected for U.S. examinees with comparable GMAT quantitative scores, and they were disproprortionately from the Asian countries in Group D.

- o Classification according to score-levels on TOEFL appears to be somewhat less promising as the primary basis for an operational moderated-prediction system: TOEFL scores are not routinely available for all ESL students (almost one-third of the ESL students in this study did not present TOEFL scores), and a strong moderating effect was evident only for those students with TOEFL scores of approximately 600 or higher. However, in addition to providing useful information regarding the general level of English language verbal skills for ESL students, TOEFL total score appears to have promise as a supplemental predictor of FYA for foreign ESL students, especially those with lower levels of developed proficiency. Generally speaking, TOEFL/FYA correlations were comparable to GMAT-V/FYA correlations.

### Further Research

The findings of this study suggest that the formal prediction-rules (multiple regression equations for predicting FYA from GMAT scores and other relevant test data) for classifications of students such as those suggested above are likely to differ—i.e., the regression systems for subgroups such as the foregoing are not likely to be comparable.

Further research is needed (a) to assess the comparability of subgroup regression systems and (b) to investigate the practical utility of a moderated prediction-system for foreign ESL applicants. A statistical model based upon empirical Bayesian concepts, has been applied by Braun and Jones (1981, 1982), in studies involving small samples of minority students in several schools of management and a number of small graduate-departmental samples, respectively. This model would seem to be adaptable for application to the problem of developing and testing the utility of a moderated-prediction system for foreign ESL applicants. Given the small, nationally-fragmented samples of foreign students in various programs, the development of an operational prediction system with program-level applicability will call for the use of a statistical model that is capable of treating data for small samples from a relatively large number of programs.

In designing further research on moderated-prediction systems for foreign ESL students, it is important to take into account and distinguish between subgroup differences in GMAT/FYA correlations that are due to the moderating effects of English-proficiency or other background variables, and differences that are due to selection-related considerations. In the present study, for example, the level of correlations tended to be lower for students in larger, more selected samples, than for those in smaller, less highly selected samples, regardless of the status of students on particular moderator variables. Selection effects on predictor/FYA relationships may be more pronounced for some foreign nationals (for example, those with very low RVPI values, characterized by very high quantitative scores and relatively low verbal scores) than for others (see Table 11, and related discussion). In future research it would be useful to have information regarding institutional practices in evaluating the academic qualifications of foreign applicants.

It is important to recognize that the schools that participated in this study are not necessarily representative of all schools offering MBA programs. The samples of foreign students had scores on GMAT that were well above the average for the general GMAT-candidate population; students with TOEFL scores were very highly selected relative to the general GMAT-TOEFL and TOEFL populations, respectively. Thus, it seems reasonable to infer that the level of English proficiency characteristic of this sample probably was higher than that for all enrolled foreign ESL students. In the design of future research involving classifications of students according to relative English-proficiency levels as indexed by TOEFL AND RVPI, it is important to take into account the general level of proficiency in the samples involved—the particular cutting points on TOEFL and RVPI used in this relatively highly selected sample might not be strictly applicable in samples with lower average levels of English proficiency.

The results of the present study, like those of studies of the characteristics and the test performance of foreign nationals taking the GRE General Test (Wilson 1984a, 1984b, 1982c), and of previous studies of the impact of language background on GMAT performance (Powers 1980; Wilson 1982c), strongly suggest that English language "verbal ability tests" are not measuring the same construct in samples of native and non-native English speakers. Verbal score differences between U.S. examinees and randomly selected foreign ESL examinee cannot be assumed to reflect valid differences in developed verbal reasoning ability. This is a consideration that should be weighed carefully in designing and interpreting the results of validation research that might involve pooling verbal test data for U.S. and foreign ESL students (or examinees).

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## Appendix A

A-1. Distribution of the Study Sample by Country of Citizenship

A-2. Intercorrelations of means on Study Variables for Student Contingents from 32 Countries

A-1

## Distribution of the Study Sample by Country of Citizenship

| COUNTRY | N |
|---|---|
| TAIWAN | 217 |
| INDIA | 209 |
| JAPAN | 158 |
| KOREA | 146 |
| THAILAND | 83 |
| MEXICO | 79 |
| HONG KONG | 77 |
| MALAYSIA | 65 |
| FRANCE | 64 |
| CANADA | 57 |
| NIGERIA | 50 |
| GREAT BRITAIN | 40 |
| BELGIUM | 39 |
| PHILIPPINES | 38 |
| GREECE | 35 |
| PAKISTAN | 30 |
| COLOMBIA | 26 |
| NETHERLANDS | 26 |
| SINGAPORE | 25 |
| FED. RP. OF GERMANY | 22 |
| VENEZUELA | 22 |
| BRAZIL | 21 |
| CHILE | 21 |
| IRAN | 20 |
| PERU | 19 |
| PEOPLE'S RP. OF CHINA | 18 |
| LEBANON | 15 |
| NORWAY | 15 |
| SWEDEN | 13 |
| ARGENTINA | 13 |
| ITALY | 13 |
| TURKEY | 13 |
| ISRAEL | 12 |
| JAMAICA | 12 |
| SPAIN | 10 |
| SOUTH AFRICA | 10 |
| GHANA | 8 |
| AUSTRALIA | 8 |
| SWITZERLAND | 8 |
| TRINIDAD AND TOBAGO | 7 |
| CYPRUS | 7 |
| SRI LANKA | 7 |
| VIETNAM | 7 |
| DENMARK | 6 |
| JORDAN | 6 |
| BANGLADESH | 5 |
| INDONESIA | 5 |
| ICELAND | 5 |
| HONDURAS | 5 |
| EGYPT | 5 |
| CAMEROON | 4 |
| IVORY COAST | 4 |
| KENYA | 4 |
| FINLAND | 4 |
| COSTA RICA | 4 |
| GUYANA | 4 |
| NICARAGUA | 4 |
| ECUADOR | 4 |
| PANAMA | 4 |
| SUDAN | 3 |
| ALGERIA | 3 |
| LIBERIA | 3 |
| GUATEMALA | 3 |
| EL SALVADOR | 3 |
| IRELAND | 3 |
| MALAWI | 2 |
| MOROCCO | 2 |
| KUWAIT | 2 |
| POLAND | 2 |
| DOMINICAN REPUBLIC | 2 |
| AUSTRIA | 2 |
| NETHERLANDS ANTILLES | 2 |
| URUGUAY | 2 |
| ETHIOPIA | 2 |
| ZAMBIA | 1 |
| CONGO | 1 |
| LESOTHO | 1 |
| ZAIRE | 1 |
| MAURITANIA | 1 |
| QATAR | 1 |
| SAUDI ARABIA | 1 |
| TUNISIA | 1 |
| SOMALIA | 1 |
| YEMEN | 1 |
| IRAQ | 1 |
| MADAGASCAR | 1 |
| LIBYA | 1 |
| TANZANIA | 1 |
| ZIMBABWE | 1 |
| SYRIA | 1 |
| LUXEMBOURG | 1 |
| PARAGUAY | 1 |
| MALTA | 1 |
| HAITI | 1 |
| CUBA | 1 |
| NEW ZEALAND | 1 |
| U. S. S. R. | 1 |
| YUGOSLAVIA | 1 |
| BOLIVIA | 1 |
| UNKNOWN | 1 |
| UNKNOWN | 1 |
| UNKNOWN | 1 |
| UNKNOWN | 1 |
| NO CODE | 1 |

Note: Throughout this study, independent nation-states, dependent territories and other geopolitical entities are all referred to for convenience as countries of citizenship.

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CORRELATIONS OF MEANS ON 11 BASIC VARIABLES, WITH JAMAICA, P. R. OF CHINA,                  14:50:29  10/31/83  PAGE
CANADA AND GREAT BRITAIN EXCLUDED--COUNTRIES WITH N LT 10 ALSO CUT--GMAT VALIDITY                     F4STAT 2.65

CORRELATIONS AMONG MEANS FOR 32 COUNTRIES


THE NUMBER OF OBSERVATIONS IS          32.

VARIABLE          SUMS          SUMS OF SQUARES          MEAN          SIGMA(N)          SIGMA(N-1)

GMAT-V          819.7468          21422.0649          25.6171          3.6338          3.6919
GMAT-Q         1088.5828          37512.1554          34.0182          3.8751          3.9371
GMAT-T        15959.4097        8010877.2103         498.7316         40.0843         40.7257
VSSCOMP        1579.8868          78744.7873          49.3715          4.8201          4.8972
SEX              36.7100             42.6091           1.1472          0.1245          0.1265
BIRTHYR        1796.3448         100895.9435          56.1358          1.3316          1.3529
USUG=1            8.6220              4.0162           0.2694          0.2300          0.2337
RVPIND         1286.8138          52749.4350          40.2129          5.5982          5.6878
TOEFMN        17237.0000        9332203.0000         538.6562         38.4810         39.0967
TOEFLTOT      18935.6838      0.11223340+08         591.7401         23.9391         24.3222
YESTOF           20.1570             14.2420           0.6299          0.2197          0.2232


CORRELATION MATRIX       CORRELATIONS AMONG MEANS FOR 32 COUNTRIES

             GMAT-V    GMAT-Q    GMAT-T   VSSCOMP       SEX   BIRTHYR    USUG=1    RVPIND    TOEFMN  TOEFLTOT    YESTOF

GMAT-V       1.0000    0.1977    0.8246    0.6141   -0.2038    0.0225   -0.2067    0.8312    0.5949    0.7381   -0.0192
GMAT-Q       0.1977    1.0000    0.7124    0.8948    0.0315   -0.0367   -0.4527   -0.3806   -0.0568   -0.0074    0.2861
GMAT-T       0.8246    0.7124    1.0000    0.9488   -0.1183   -0.0143   -0.3957    0.3737    0.4039    0.5318    0.1404
VSSCOMP      0.6141    0.8948    0.9488    1.0000   -0.0642   -0.0203   -0.4542    0.0715    0.2250    0.3304    0.2172
SEX         -0.2038    0.0315   -0.1183   -0.0642    1.0000    0.0332    0.2128   -0.2124   -0.2621   -0.2854   -0.2843
BIRTHYR      0.0225   -0.0367   -0.0143   -0.0203    0.0332    1.0000    0.0432    0.0428    0.0384   -0.0644    0.0948
USUG=1      -0.2067   -0.4527   -0.3957   -0.4542    0.2128    0.0432    1.0000    0.0588   -0.3451   -0.1825   -0.7810
RVPIND       0.8312   -0.3806    0.3737    0.0715   -0.2124    0.0428    0.0588    1.0000    0.5933    0.7001   -0.1773
TOEFMN       0.5949   -0.0568    0.4039    0.2250   -0.2621    0.0384   -0.3451    0.5933    1.0000    0.7127    0.1970
TOEFLTOT     0.7381   -0.0074    0.5318    0.3304   -0.2854   -0.0644   -0.1825    0.7001    0.7127    1.0000    0.0261
YESTOF      -0.0192    0.2861    0.1404    0.2172   -0.2843    0.0948   -0.7810   -0.1773    0.1970    0.0261    1.0000
```

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# Appendix B

B-1. Preliminary Report to Participating Schools

B-2. Plot of GMAT Verbal and GMAT Quantitative Means for Smaller, Medium, and Larger Samples, indicating Relationship between Sample Size and Degree of Selection on the GMAT

# THE VALIDITY OF GMAT SCORES FOR PREDICTING FIRST YEAR AVERAGE FOR FOREIGN STUDENTS IN MBA PROGRAMS

Educational Testing Service
Princeton, NJ 08541

To: Study Coordinators
From: Kenneth M. Wilson

Subject: An Interim Report
Date: March 1, 1984

Due to differences between foreign nationals and U.S. citizens in linguistic, cultural, and educational backgrounds, information regarding the predictive validity of traditional academic predictors, such as GMAT scores and the undergraduate GPA based on samples composed primarily of students who are U.S. citizens should not be assumed to be applicable for foreign nationals who apply for admission, especially those for whom English is a second language. To enhance understanding of how GMAT scores and other information about foreign students relate to their performance during the first year in MBA programs, all schools of management were invited, in March 1983, to participate in an essentially exploratory cooperative study by supplying a standard set of data for foreign nationals who enrolled for the first time, as full-time students, in fall 1982 (and fall 1981 if needed to augment sample size).

The data requested were as follows:

- GMAT Verbal, Quantitative and Total scaled scores
- Undergraduate GPA (optional)
- Total score on the Test of English as a Foreign Language (TOEFL), if available
- Sex
- Birthyear (inversely related to age)
- Undergraduate origin (U.S. vs other)
- Native language
- Country of citizenship
- First year average

A total of 59 schools supplied data (for a total of about 1900 foreign students), most of them for the 1982 entering cohort of foreign students only.* All 59 schools supplied GMAT scores, the first-year average (FYA), birthyear, native language, and country of citizenship. Attesting implicitly to the problem of evaluating the undergraduate academic performance of foreign applicants, only 21 schools supplied data on the undergraduate GPA or UGPA. Two schools did not provide data on the sex of students and four did not indicate the undergraduate origins of students. Finally, two of the 59 schools did not report scores on TOEFL Total score for any student--among the 57 schools that did report TOEFL scores, the percentage of students for whom a score was reported ranged downward from about 98 percent to approximately 17 percent.

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* One additional school supplied data for cohorts entering at times and in years other than those specified for the study. Data for this school are not included in this summary report.

## About this Report

This interim report presents selected results of standard statistical analyses of data for foreign ESL (English second language) students from each of the 59 participating schools, namely, (a) information regarding the level and distribution of scores on GMAT and other variables, and (b) coefficients of correlation indicating the interrelationships among GMAT scores, TOEFL Total scores, first-year average (FYA), and UGPA (if provided).*

Twenty-five of the 59 schools participating in this study had participated prior to June 1983 in the GMAC Validity Study Service (VSS) at ETS by submitting GMAT scores, first-year performance (FYA), and other data for all first-year MBA students. For these 25 schools, findings from their previously studied general VSS samples provide a basis for comparison with findings for foreign-ESL students in the present study.

Emphasis in this interim report is on trends in selected findings across all schools rather than on the specific findings for your school which are attached to your copy of this report. The reason for this has to do with sample size. As may be seen in Figure 1, the samples of foreign ESL students by school are all quite small by usual validity study standards. The median N for the 59 samples is 26, with a range of Ns between 6 and 77. Only three of 85 general first-year samples studied by the GMAC VSS during the academic years 1977-78 through 1979-80 included fewer than 77 students and the mean sample size was 175 (Hecht & Powers, 1982). Findings for single small samples do not provide reliable bases for generalization. However, given comparable data (GMAT scores and FYA) for a relatively large number of small samples, it is possible to draw some useful inferences regarding the relationship of GMAT scores to first-year performance by examining trends in the level of GMAT/FYA relationships over all samples.

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*The correlation coefficient is a generally familiar index of association or covariation between variables. The size of a coefficient indicates the degree or closeness of association between two variables on a scale ranging from .00 (indicating no relationship at all), through 1.00 (indicating either a perfect positive or a perfect negative relationship. If the relationship is positive, higher standing on one variable tends to be associated with higher standing on the other; if negative, higher standing on one variable is associated with lower standing on the other and vice versa.

| | |
|---|---|
| 7 | 7 |
| 6 | 24558 |
| 5 | 03 |
| 4 | 034499 |
| 3 | 02236679 |
| 2 | 0001112222233455567777889 |
| 1 | 11234456 |
| 0 | 66799 |

No. schools (59)

Mdn N 26

_Note._ Combine number in the first column with subsequent entries to read sample sizes. For example, the largest sample included 77 students, there were three samples with 20 students, etc.

Figure 1. Distribution of samples of foreign-ESL students by size

Accordingly, it is important that you view the attached findings for your school primarily as descriptive of relationships among variables in one relatively small sample. In evaluating the findings for your school and trends in correlations between test scores and FYA across schools, it is useful to keep in mind the following general points about predictive validity data.

1) Evidence from validity studies that have been conducted extensively in undergraduate and other settings, involving measures of developed abilities (e.g., verbal and quantitative reasoning) and measures of academic performance (e.g., grade point averages), as well as more general evidence of the positively interrelated organization of human abilities, leads to the a priori expectation that validity coefficients for academic predictors (such as standard admissions tests or UGPA) and academic criteria (such as FYA) should tend to be positive. In essence, it is reasonable to assume that individuals with "better qualifications" (as reflected in their past academic record and their scores on measures of developed verbal and quantitative abilities) should tend to be somewhat "better students" (as reflected in faculty assessments of their performance). Negative coefficients for academic predictors and criteria are, therefore, properly perceived as theoretically anomalous. When observed, they indicate the need for further exploration and analysis designed to illuminate the particular circumstances involved. In small samples such as those under consideration here, negative coefficients are most probably due to simple sampling fluctuation.

2) Generally speaking, the size of validity coefficients for variables used in selection tends to vary inversely with the degree of restriction of range of talent in samples being studied. In samples in which students are homogeneously high on an admissions measure, the relationship between scores on that measure and measures of performance in the program tends to be lower than would be obtained if the school admitted students representing the full range of talent (e.g., a group representative of all college seniors aspiring to MBA programs).

3) The foregoing points are relevant to any evaluation of reported validity study results. In evaluating the school data for samples of foreign students from non-native English speaking societies it is important as well to consider the potential attenuating effect on the relationship between standard predictors and criteria (e.g., scores and FYA) of differences in the linguistic, cultural, and educational backgrounds of the students in the particular samples being analyzed. These effects, which will be examined in the pooled data analysis, cannot be evaluated directly in the data reported herein.

## Selected Findings

Figure 2 shows distributions of the 59 school means on GMAT verbal and GMAT quantitative, respectively, for foreign-ESL students. Verbal means ranged from 12 to 32 (median of 24) while quantatitive means ranged from 16 to 43 (median of 35). For perspective, the means for all U.S. examinees tested during 1980-81 on these two measures were 28.3 and 26.8 for verbal and

| | GMAT Verbal | | GMAT Quantitative |
|---|---|---|---|
| 4 | | 4 | 0000111333 |
| 3* | | 3* | 5555556666667888899999 |
| 3 | 00012 | 3 | 000001112223334444 |
| 2* | 555555556777788899999 | 2* | 566699 |
| 2 | 00000011111222222344444 | 2 | 44 |
| 1* | 558888889 | 1* | 6 |
| 1 | 2 | 1 | |
| No. means | (59) | | (59) |
| Median | 24 | | 35 |

Note. Combine number in first column with subsequent entries to read sample means rounded to whole numbers. For example, there were three verbal means of 30, one of 31, one of 32, etc.

Figure 2. Distribution of sample means on GMAT Verbal and Quantitative

quantitative respectively (GMAC, 1982). It is evident that these foreign-student samples have been very highly selected on quantitative ability--only seven (11.9 percent) of the samples had average scores on GMAT quantitative that were lower than 29. By way of contrast, 42 (71.2 percent) had verbal means lower than 27 on GMAT verbal. However, the verbal median of 24 is higher (by almost one-half of a standard deviation) than the mean of approximatly 20 obtained by all foreign nationals, without regard to language background, who took GMAT during 1977-1979, whose quantitative mean (27) was equal to that for all GMAT examinees tested during that period (Wilson, 1982b; Powers, 1980). Thus, it may be concluded that relative to all foreign nationals the students in these samples were highly selected on both verbal and quantitative, although more highly selected on quantitative than on verbal ability. It is important to note, in passing, that the mean quantitative performance of foreign nationals taking GMAT, is comparable to that of U.S. citizens while the verbal mean tends to be considerably lower.

Figure 3 shows distributions of simple correlation coefficients between designated predictors and FYA for the 59 schools. The predictors are GMAT scores (verbal, quantitative, and total), and a standard composite of GMAT verbal and quantitative scores (Q + .6V). Separate distributions of correlations are shown for the 21 schools that reported UGPA. The weighting of the verbal and quantitative scores in the standard composite (namely, Q + .6V) reflects the ratio of average weights for these two scores derived in analyses of data for all entering students from the 25 study schools that previously participated in the GMAC Validity Study Service (VSS) at ETS. Several features of these distributions are noteworthy.

- o Despite the fact that the samples under consideration are heterogeneous with respect to linguistic, cultural and educational background variables, the observed correlations for the test scores (and the score composite) with FYA are preponderantly positive.

- o Based on the median values, for "all schools" the GMAT quantitative tends to be a better predictor of FYA (median = .30) than is either GMAT total (median = .27) or GMAT verbal (median = .16). The finding that the median coefficient for GMAT total is less than that for GMAT quantitative alone may be understood most simply in terms of (a) the lower median validity for GMAT verbal than GMAT quantitative and (b) the fact that the GMAT contains more verbal items than quantitative by a ratio of approximately 3 to 2. Thus, the less valid predictor (verbal) is weighted more heavily than the more valid predictor (quantitative) in the GMAT total score.

- o For the 21 schools providing UGPA, the median coefficient was .12; the distribution of coefficients for GMAT scores for these schools was about the same as for all schools. Thus, UGPA tends to be somewhat less closely related to FYA than GMAT scores in these samples of

| | All schools | | | |
|---|---|---|---|---|
| | GMAT-V | GMAT-Q | GMAT Total | Q + .6V* |
| .7 | 5 | 8 | 7 | 034 |
| .6 | 5 | 39 | 2578 | 14 |
| .5 | 2248 | 1144459 | 3444558 | 111355667 |
| .4 | 1345678 | 13566 | 0014457788 | 224578 |
| .3 | 0146679 | 00111113446688 9 | 16 | 00112246678 |
| .2 | 000455 | 001224455679 | 22[illegible]45577899 | 016788889 |
| .1 | 0011266999 | 0035 | 13[illegible]5666888 | 00236679 |
| .0 | 334444569 | 333449 | 446678 | 1467 |
| -.0 | 123449 | 156 | 48 | 01446 |
| -.1 | 0789 | 112 | 6 | 6 |
| -.2 | 45 | 5 | - | - |
| -.3 | - | | 5 | 2 |
| -.4 | - | | - | |
| -.5 | 9 | | 2 | |
| -.6 | 6 | | | |
| No. coeff. | (59) | (59) | (59) | (59) |
| Mdn coeff. | .16 | .30 | .27 | .30 |

| | Schools providing UGPA | | | |
|---|---|---|---|---|
| | V | Q | Q+.6V* | UGPA |
| .7 | | | 0 | |
| .6 | | 9 | 4 | |
| .5 | | 1444 | 1137 | 23 |
| .4 | 157 | 5 | 27 | 7 |
| .3 | 479 | 03498 | 122 | 37 |
| .2 | 055 | 0257 | 0169 | 447 |
| .1 | 0669 | 3 | 37 | 269 |
| .0 | 44456 | 344 | 6 | 47 |
| -.0 | 4 | - | 16 | 26 |
| -.1 | 09 | 1 | 6 | 5 |
| -.2 | | 5 | | 245 |
| -.3 | | | | - |
| -.4 | | | | 07 |
| -.5 | | | | |
| -.6 | | | | |
| No. coeff. | (21) | (21) | (21) | (21) |
| Mdn coeff. | .16 | .30 | .31 | .12 |

Note. In these distributions, the initial digit of a coefficient is indicated in the first column and the second digit of each coefficient is recorded in the second and subsequent columns. Thus, for example, there was one GMAT-V coefficient of .75, one of .65; one GMAT-Q coefficient of .78, one of .63 and one of .69; etc.

*This is a composite of GMAT verbal and quantitative scores, weighted according to the ratio of typical weights for these scores as derived in total samples of students from 25 study schools that previously participated in the GMAC Validity Study Service.

Figure 3. Distributions of correlations of designated predictors with FYA by school

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foreign-ESL students all of which are made up of individuals with diverse undergraduate educational origins--only about 23 percent of all foreign ESL students were graduates of a U.S. undergraduate school.*

Useful perspective for evaluating the distributions of correlations betwen GMAT scores and FYA for foreign ESL students is provided in Figure 4 which provides (a) distributions of GMAT validity coefficients in samples composed of all students (U.S. citizens only and/or U.S. citizens and non-citizens) based on 85 studies completed by the GMAC VSS during the three-year period 1978-79 through 1980-81 and (b) similar distributions for all-student and foreign-ESL students, respectively, for the 25 study schools for whom "all student" validity studies were completed by the GMAC VSS during the five-year period 1978-79 through 1982-83 and (c) data on sample characteristcs. Several features of these distributions warrant comment.

- The average sample size for the 85 regular VSS samples was about 175, and that for regular samples from the 25 study-schools was 181, as compared to 32 for foreign ESL students only.
- The all-student samples from the 25 study-schools that previously participanted in the GMAC VSS tended to be more highly selected on both GMAT verbal and GMAT quantitative than those from the 85 VSS participants generally (compare range of school means on verbal and quantitative for the general VSS participating group and the joint VSS and study participants).

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The median correlations between FYA and verbal and quantitative scores in the 85 VSS "all student" samples were .25 and .30, respectively. However, for the subgroup of 25 schools the comparable "all student" coefficients were .18 and .28 (somewhat lower than typical coefficients for all 85 VSS schools) and for this same subgroup of schools the coefficients for foreign-ESL samples only were .20 for verbal and .25 for quantitative (as compared to .16 and .30 for all 59 foreign-ESL samples).

On balance the findings summarized in Figure 3 and Figure 4 suggest that for foreign ESL samples that are heterogeneous with respect to national origin (a) the correlation between GMAT quantitative scores and first-year GPA tends to be comparable to that observed for all first-year students (predominantly samples of U.S. citizens), (b) the correlation of GMAT verbal scores and UGPA with FYA tends to be somewhat lower than that observed for U.S. citizens only, a result that might be expected given the heterogeneity of the foreign-ESL population with respect to linguistic, cultural, and educational background variables that might be expected to attenuate the relationship with FYA of verbal test scores and indices of past academic performance.

---

*In several instance UGPA was missing for a substantial number of students. Reasons for this are not known. Accordingly limitations of the UGPA data should be recognized.

## Distribution of Validity Coefficients

### GMAT Verbal vs FYA

|  | All VSS participants (1978-79 - 1980-81) All students (VSS) | Participants in both VSS (thru 6/83)& this study All students (VSS) | Foreign Study |
|---|---|---|---|
| .7* |  |  |  |
| .7 |  |  |  |
| .6* |  |  |  |
| .6 |  |  |  |
| .5* |  |  | 8 |
| .5 |  |  | - |
| .4* |  |  | 578 |
| .4 | 0122 | 0 | 14 |
| .3* | 55666 68999 | 56 | 67 |
| .3 | 00111 22233 333 | 023 | 14 |
| .2* | 55556 67777 78999 9 | 59 | - |
| .2 | 00011 12333 33334 44 | 223 | 004 |
| .1* | 55667 8999 | 55677 7889 | 699 |
| .1 | 11122 34 | 114 | 0 |
| .0* | 56777 9 | - | 569 |
| .0 | 224 | 02 | 3 |
| -.0 |  |  | - |
| -.0* |  |  | - |
| -.1 |  |  | - |
| -.1* |  |  | 78 |
| -.2 |  |  | 4 |
| -.2* |  |  | 5 |
| -.3 |  |  |  |
| -.3* |  |  |  |
| -.4 |  |  |  |
| -.4* |  |  |  |

### GMAT Quantitative vs FYA

|  | All VSS participants (1978-79 - 1980-81) All students (VSS) | Participants in both VSS (thru 6/83) & this study All students (VSS) | Foreign Study |
|---|---|---|---|
| .7* |  |  | 8 |
| .7 |  |  | - |
| .6* |  |  | - |
| .6 |  |  | - |
| .5* |  |  |  |
| .5 | 03 | 00 | 114 |
| .4* | 77788 | 8 | 56 |
| .4 | 00011 223 | 23 | - |
| .3* | 55566 67889 9 | 56699 | 6668 |
| .3 | 00011 12223 33344 44 | 22 | 01 |
| .2* | 56677 77777 78888 9 | 55578 | 5 |
| .2 | 11223 4 | 01 | 024 |
| .1* | 56889 | 68 | - |
| .1 | 01233 44444 | 134 | 003 |
| .0* | 6679 | 8 |  |
| .0 | 3 |  | 334 |
| -.0 |  |  | 6 |
| -.0* |  |  | - |
| -.1 |  |  | 1 |
| -.1* |  |  | - |
| -.2 |  |  | - |
| -.2* |  |  | 5 |
| -.3 |  |  |  |
| -.3* |  |  |  |
| -.4 |  |  |  |
| -.4* |  |  |  |

|  | Verbal: All VSS (All students) | Verbal: Both VSS & this study (All students) | Verbal: Foreign Study | Quantitative: All VSS (All students) | Quantitative: Both VSS & this study (All students) | Quantitative: Foreign Study |
|---|---|---|---|---|---|---|
| No. schools | 85 | 25 | 25 | 85 | 25 | 25 |
| Mdn coefficient | (.25) | (.18) | (.20) | (.30) | (.30) | (.25) |
| Mdn N/school | 175 | 181 | 32 | 175 | 181 | 32 |
| Range of means | 14.9 - 38.4 | 27.3-39.2 | 15.4-32.3 | 15.1-37.8 | 26.0-41.1 | 26.1-43.3 |

Figure 4. Comparative distributions of correlations of GMAT scores for FYA for "all student" and foreign-ESL students only.

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It is worth noting here that the principal difference between the distributions of GMAT validity coefficients for the 25 joint VSS-and-study participants appears to be the greater range of coefficients for the much smaller foreign-ESL samples than for the larger "all student" samples. As indicated earlier, such a difference might be explained in terms of differences in the degree of sampling fluctuation around similar population correlation values for "all student" and foreign student samples. Major attention should be focussed on trends in the level of coefficients.

## Related Findings

In Figure 4, as previously noted, the range of observed correlations is considerably greater for the small foreign-ESL samples than for the large all-student samples. However only a selected subset of foreign ESL samples is represented. In order to assess variation in observed correlations of GMAT scores with FYA for foreign-ESL students in relation to sample size, the distributions in Figure 5 were tabulated.

This figure shows distributions of quantitative and verbal score correlations with FYA for 13 samples with N less than 20, 24 samples with N = 20-29 and 22 samples with N of 30 or greater. It is noteworthy that for the quantitative test, median validity tends to vary inversely with sample size categories, being highest for the smallest samples ($r = .39$ for $N < 20$) and lowest for the 22 largest samples ($r = .25$, the same as for the joint VSS and study subgroup), with the median for samples in the middle size-range falling in between ($r = .30$). Trends for verbal score validity, on the other hand, are not systematic: the verbal score median for the smallest size-category ($r = .25$) is higher than that for the largest size-category ($r = .19$), but the median for the middle-size category is only .07.

In evaluating this outcome, it is important (a) to know that the larger samples were more highly selected on GMAT quantitative ability than the smaller ones and (b) to recall the general principle that validity coefficients for a predictor tend to decrease as the degree of prior selection on that predictor increases.

## Other Findings

Total scores on the Test of English as a Foreign Language (TOEFL) were reported for one or more students by 57 schools. The median percentage with TOEFL Total was about 68; however, the percentage of students with TOEFL scores varied considerably (from 17 percent to 98 percent). Accordingly, the number of students with TOEFL and FYA was systematically less than the number with GMAT scores and FYA.

The median of TOEFL means for the 57 schools was approximately 580, and the mean for all TOEFL-takers without regard to school was 588. Sample means ranged from 513 to 617, but the great majority of samples (about 85 percent)

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had TOEFL means of approximately 550 or higher and almost one-third of the sample means were 600+. For perspective it is useful to note that the TOEFL mean for all GMAT/TOEFL examinees during 1977-79 (Wilson, 1982) was 553, and that for all U.S.-graduate-school-bound TOEFL-takers during 1977-79 (Wilson, 1982a) was only 511. Thus, the foreign-ESL TOEFL-takers in the samples under consideration in this study are quite highly selected in terms of measured English proficiency as indexed by TOEFL Total. The median correlation between TOEFL Total and FYA for 56 samples was .22. Figure 6 shows two sets of distributions of the observed coefficients, one involving four size-categories and the other only two, to provide additional empirical perspective on variability in sampling fluctuation of coefficients due to sample size.

In evaluating these correlations, it is important to keep in mind that they represent relationships in selected subsamples of foreign-ESL students from the respective schools and hence should not be compared directly with the distributions of coefficients for GMAT verbal or quantitative which are based on all ESL students in the respective school samples.

### The Findings for Your School

Descriptive statistics for the sample of foreign ESL students from your school are provided below on the following variables:

FYA (first-year average)
GMAT verbal
GMAT quantitative
GMAT total
VSS Composite (Q + .6V)
TOEFL Total (if available)
UGPA (if available)
Optional variable (if supplied).

The number of students with observations on each variable is shown, along with means, standard deviations, and minimum and maximum values for each variable. A table of intercorrelations of all the variables is also shown.

The number of students, as indicated in the output below, may be less than the number of students included on your basic data roster. This will be the case if (a) any native-English speaking students were included in your sample--for this preliminary analysis, these students were not included, (b) there were missing observations on essential variables for any student (e.g., GMAT scores, FYA) or (c) there were values on the roster for any variable that were inconsistent (e.g., beyond the range of values specified for a variable).

Please review the general interpretive considerations outlined on page 4 of the report. Remember that the findings reported below are based on a very small sample by usual validity study standards. It would also be useful to re-examine the data reported in Figures 5, that show how the relationship between a predictor (GMAT quantitative) and a criterion (FYA) tends to be lower for more highly selected samples and higher for samples that are less highly selected on the predictor. It is reasonable to assume that if it were

**Correlation of GMAT Quantitative with FYA**

|  | All schools | Sample size <20 | 20-29 | 30+ |
|---|---|---|---|---|
| .7 | 8 | 8 |  |  |
| .6 | 39 | 39 |  |  |
| .5 | 1144459 | 14 | 459 | 14 |
| .4 | 13566 | 5 | 1366 | - |
| .3 | 001111134466889 | 19 | 011346 | 0114688 |
| .2 | 001224455679 | 02 | 12479 | 04556 |
| .1 | 0035 | 5 | - | 003 |
| .0 | 333449 | 4 | 339 | 34 |
| -.0 | 156 | 5 | 1 | 6 |
| -.1 | 112 |  | 12 | 1 |
| -.2 | 5 |  |  | 5 |
| No. schools | (59) | (13) | (24) | (22) |
| Median r | .30 | .39 | .30 | .25 |

**Correlation of GMAT Verbal with FYA**

|  | All schools | Sample size < 20 | 20-29 | 30+ |
|---|---|---|---|---|
| .7 | 5 | 5 |  |  |
| .6 | 5 | - | 5 |  |
| .5 | 2248 | 48 | 22 |  |
| .4 | 1345678 | - | 38 | 14567 |
| .3 | 0146679 | 07 | 149 | 66 |
| .2 | 000455 | 55 | 04 | 00 |
| .1 | 0011266999 | - | 02 | 0116699 |
| .0 | 33444569 | 4 | 344 | 34569 |
| -.0 | 123449 | 44 | 1239 |  |
| -.1 | 0789 | 0 | 789 |  |
| -.2 | 45 | 4 | 5 |  |
| -.3 | - | - | - |  |
| -.4 | - | - | - |  |
| -.5 | 9 | - | 9 |  |
| -.6 | 6 | 6 |  |  |
| No. schools | (59) | (13) | (24) | (22) |
| Median r | .16 | .25 | .07 | .19 |

Figure 5. Distributions of correlations of GMAT scores with FYA by size of sample: Foreign-ESL students, 59 schools

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Figure 6. Distributions of correlations of TOEFL Total with FYA by sample size

| | Set 1[c] Sample size | | | |
|---|---|---|---|---|
| | ≤10 | 10-19 | 20-29 | 30+ |
| .6* | | 79 | | |
| .6 | 0 | - | | |
| .5* | 689 | - | 6 | |
| .5 | - | 2 | - | 4 |
| .4* | 9 | 58 | - | 6 |
| .4 | - | 1 | - | 0 |
| .3* | - | 6 | - | 7 |
| .3 | - | - | - | 3 |
| .2* | 5 | - | 7 | 78 |
| .2 | 34 | 2 | 22 | 34 |
| .1* | - | 66 | - | 69 |
| .1 | - | 3 | - | - |
| .0* | - | 5 | 56 | 5 |
| .0 | 4 | - | - | 1 |
| -.0 | - | - | - | 0 |
| -.0* | 7 | 8 | 9 | 8 |
| -.1 | - | - | - | 2 |
| -.1* | - | - | 6 | |
| -.2 | - | 13 | | |
| -.2* | - | 5 | | |
| -.3 | - | 02 | | |
| -.3* | - | 5 | | |
| -.4 | - | 0 | | |
| -.4* | - | | | |
| -.5 | - | | | |
| -.5* | - | | | |
| : | - | | | |
| -.9* | 79# | | | |
| No. | (12) | (20) | ( 8) | (16) |
| Mdn | .24 | .15 | .14 | .23 |

| | Set 2[c] Sample size | | All samples |
|---|---|---|---|
| | <20 | 20+ | |
| .6* | 79 | | 79 |
| .6 | 0 | | 0 |
| .5* | 689 | 6 | 6689 |
| .5 | 2 | 4 | 24 |
| .4* | 589 | 6 | 5689 |
| .4 | 1 | 0 | 01 |
| .3* | 6 | 7 | 67 |
| .3 | - | 3 | 3 |
| .2* | 5 | 778 | 5778 |
| .2 | 234 | 2234 | 2223344 |
| .1* | 66 | 69 | 6669 |
| .1 | 3 | - | 3 |
| .0* | 5 | 556 | 5556 |
| .0 | 4 | 1 | 14 |
| -.0 | - | 0 | 0 |
| -.0* | 78 | 89 | 7889 |
| -.1 | - | 2 | 2 |
| -.1* | - | 6 | 6 |
| -.2 | 13 | | 13 |
| -.2* | 5 | | 5 |
| -.3 | 02 | | 02 |
| -.3* | 5 | | 5 |
| -.4 | 0 | | 0 |
| -.4* | - | | - |
| -.5 | - | | - |
| -.5* | - | | - |
| : | - | | - |
| -.9* | 79 | | 79 |
| No. | (32) | (24) | (56) |
| Mdn | .19 | .22 | .22 |

_Note_. Three schools did not report TOEFL scores for any student. Widely varying proportions of students with TOEFL scores are represented in the respective samples. Ns with TOEFL scores ranged from three to 62.

[c] Set 1 distributions show trends across four sample-size categories, while Set 2 shows distributions for the two smaller and the two larger sample-size categories as well as the distribution for all schools.

#These two coefficients are each based on N = 3.

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somehow possible to obtain for your school a very large similarly selected sample of foreign ESL students, the magnitude of validity coefficients for GMAT verbal and quantitative, respectively, in that sample would most likely be somewhere between the medians reported for other similarly selected samples and the values reported below for your school—and given a very large sample it is unlikely that the validity coefficients would be negative.

You may find that the correlation between GMAT verbal and quantitative is negative in your sample (this was the case in 22 of the 59 samples studied). In the general GMAT population, the correlation between V and Q is in the .55 - .57 range; for all foreign-ESL GMAT examinees a correlation of .50 may be representative of the relationship (Wilson, 1982b). The correlation between these two predictors tends to be lower in highly selected samples (for 1,767 ESL students in the present study it is only .295 as compared to .50 for all foreign ESL GMAT examinees). Given the small size of the sample, the observed negative coefficient may be due to simple sampling fluctuation. However, negative relationships between these predictors may reflect, in part, the effects of compensatory selection—i.e., requiring very high performance on one predictor if performance on another or others is very low and a tendency to screen out candidates who are very low on both or all predictors.

Your assistance in this cooperative endeavor is appreciated. Do not hesitate to call or write if you have questions about this report or the data for your school.

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School Findings

## References

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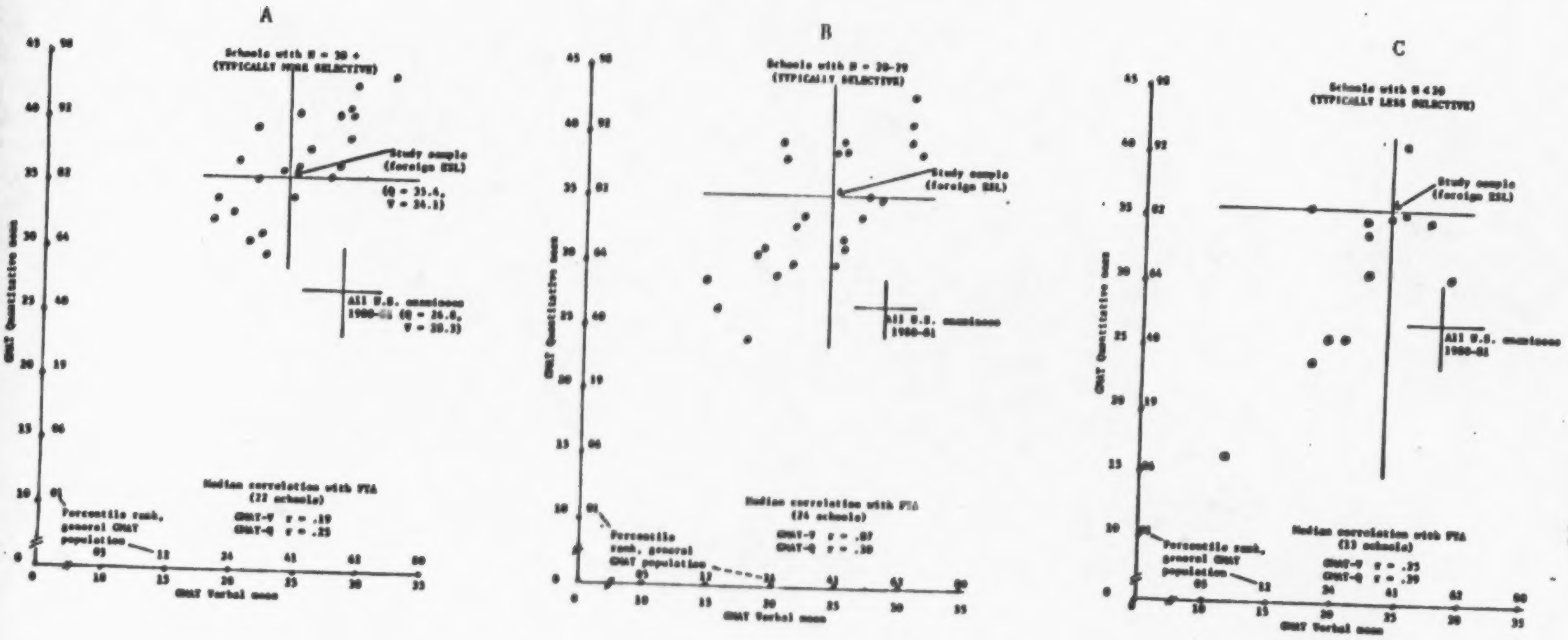
Powers, D. E. *The relationship between scores on the Graduate Management Admission Test and the Test of English as a Foreign Language*. TOEFL Research Report No. 5. Princeton, NJ: Educational Testing Service, 1980.

Wilson, K. M. *A comparative analysis of TOEFL examinee characteristics, 1977-79.* TOEFL Research Report No. 11 & ETS RR-82-27. Princeton, NJ: Educational Testing Service, 1982a.

Wilson, K. M. *GMAT and GRE Aptitude Test performance in relation to primary language and scores on TOEFL.* TOEFL Research Report No. 12 & ETS RR-82-28. Princeton, NJ: Educational Testing Service, 1982b.



Plots of GMAT verbal and quantitative score means for schools classified by number of foreign-ESL students in the study, illustrating the relationship between school-sample size and selection on GMAT

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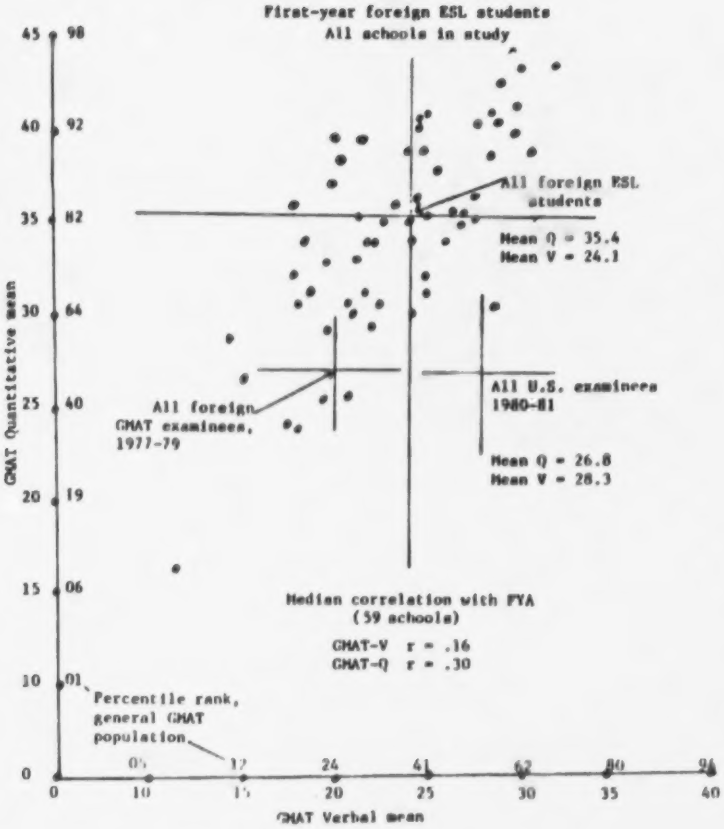
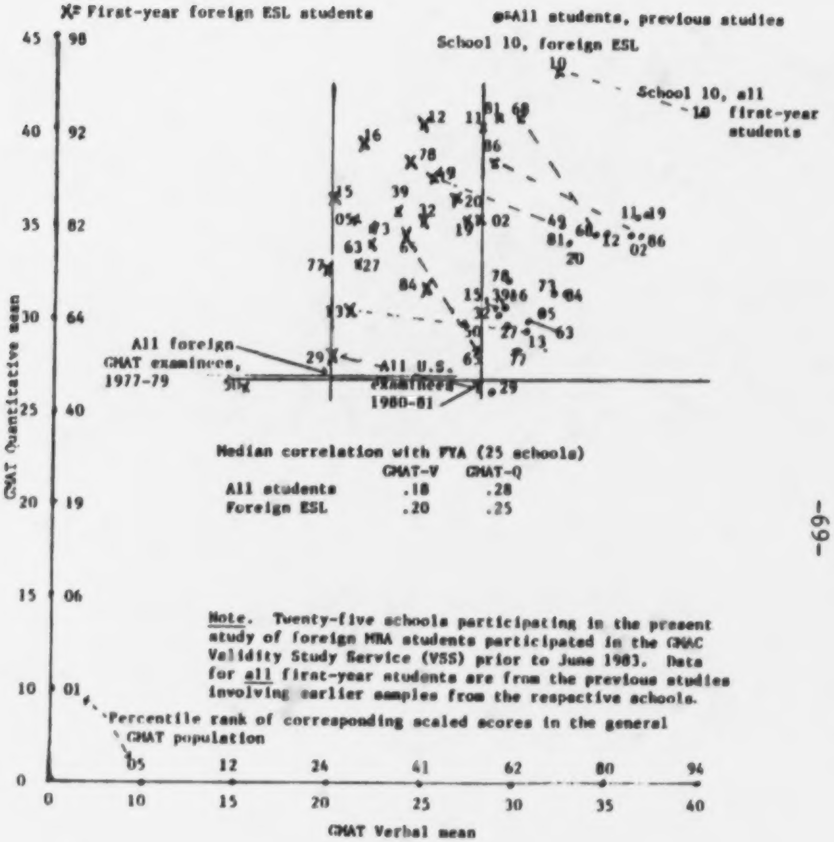
A



Plot of verbal and quantitative score means for foreign ESL students from schools participating in the study

B



Median correlation with FYA (25 schools)

| | GMAT-V | GMAT-Q |
|---|---|---|
| All students | .18 | .28 |
| Foreign ESL | .20 | .25 |

Note. Twenty-five schools participating in the present study of foreign MBA students participated in the GMAC Validity Study Service (VSS) prior to June 1983. Data for all first-year students are from the previous studies involving earlier samples from the respective schools.

Parallel plots of the verbal and quantitative score means of foreign ESL and general student samples for 25 schools: Study schools that previously participated in the GMAC VSS at ETS by sending samples of U.S. MBA students for analysis

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# Appendix C

C-1. Raw Score and T-Scaled Means on Study Variables for the analysis groups in Table 1

C-2. Scatterplot of GMAT Verbal and TOEFL Scores for Foreign-ESL Students

C-3. Scatterplot of GMAT Verbal and GMAT Quantitative Scores for Foreign-ESL Students

C-4. Scatterplot of GMAT Verbal and GMAT Quantitative Scores for Foreign-ESL Students

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BASIC STATISTICS FOLLOWED BY MISSING DATA REGRESSIONS-- BY ANALYSIS GROUP
SECTION F OF MEMO OF 3/2/84--GMAT VALIDITY

BASIC STATISTICS BY ANALYSIS GROUP ON RAW VATABLES

                       MIDEASTERN(1)  *                                 THAILAND(2)    *                               TAIWAN(3)      *

                N     MEAN     S.D.     MIN      MAX         N     MEAN     S.D.     MIN      MAX         N     MEAN     S.D.     MIN      MAX

GMAT-V         61    22.23     8.91     4.00    39.00       83    16.84     6.26     3.00    34.00      216    21.51     6.31     5.00    48.00
GMAT-Q         61    31.20     9.00    10.00    51.00       83    31.87     6.88    15.00    47.00      216    40.56     6.76    18.00    57.00
GMAT-T         61   457.11   106.35   200.00   690.00       83   419.42    70.84   200.00   590.00      216   503.04    69.63   290.00   720.00
VSSCOMP        61    44.53    12.69    12.40    73.20       83    41.97     8.52    16.80    63.20      216    53.47     8.60    27.20    79.20
RVPINDEX       61    37.58    11.15    16.56    72.79       83    29.18     9.62     6.20    60.16      216    28.86     9.36     2.01    70.35
TOEFLVEL       61   473.79    20.96   433.00   505.00       83   472.00     0.0    472.00   472.00      216   514.00     0.0    514.00   514.00
TOEFTOT        27   566.70    54.38   473.00   660.00       51   543.16    47.74   410.00   643.00      181   554.15    32.08   480.00   640.00
YESTOEFL       61     0.44     0.50     0.0      1.00       83     0.61     0.49     0.0      1.00      216     0.84     0.37     0.0      1.00
SEX            61     1.15     0.35     1.00     2.00       83     1.43     0.50     1.00     2.00      216     1.45     0.50     1.00     2.00
BIRTHYR        61    56.02     3.94    44.00    61.00       83    56.81     2.58    46.00    61.00      216    55.60     2.86    40.00    60.00
US-UG=1        57     0.49     0.50     0.0      1.00       83     0.16     0.36     0.0      1.00      215     0.09     0.28     0.0      1.00


                       KOREA(4)       *                                 JAPAN(5)       *                               HONG KONG(6)   *

                N     MEAN     S.D.     MIN      MAX         N     MEAN     S.D.     MIN      MAX         N     MEAN     S.D.     MIN      MAX

GMAT-V        146    23.37     6.52     9.00    39.00      158    21.30     5.72     2.00    36.00       77    25.60     5.99    15.00    41.00
GMAT-Q        146    42.03     5.98    27.00    54.00      158    40.93     6.34    24.00    55.00       77    36.48     5.73    22.00    48.00
GMAT-T        146   527.79    71.83   340.00   690.00      158   507.13    64.09   310.00   650.00       77   514.61    62.00   390.00   680.00
VSSCOMP       146    56.05     8.36    34.40    75.00      158    53.71     7.99    30.40    70.60       77    51.84     7.18    38.00    70.40
RVPINDEX      146    30.37     8.77     6.84    54.79      158    28.26     8.54     3.37    56.97       77    30.16     9.30    21.58    58.52
TOEFLVEL      146   513.00     0.0    513.00   513.00      158   504.13     1.59   504.00   524.00       77   505.00     0.0    505.00   505.00
TOEFTOT       117   576.26    30.55   483.00   664.00      133   581.69    30.95   470.00   660.00       28   579.93    30.02   510.00   640.00
YESTOEFL      146     0.80     0.40     0.0      1.00      158     0.84     0.36     0.0      1.00       77     0.36     0.48     0.0      1.00
SEX           146     1.04     0.20     1.00     2.00      157     1.06     0.24     1.00     2.00       77     1.25     0.43     1.00     2.00
BIRTHYR       146    54.03     3.55    40.00    61.00      158    53.77     2.91    46.00    60.00       77    57.40     2.95    48.00    61.00
US-UG=1       140     0.08     0.27     0.0      1.00      145     0.08     0.26     0.0      1.00       77     0.74     0.44     0.0      1.00


                       SUBTOTAL(7)    *                                 MEXICO(8)      *                               S. AMERICAN(9) *

                N     MEAN     S.D.     MIN      MAX         N     MEAN     S.D.     MIN      MAX         N     MEAN     S.D.     MIN      MAX

GMAT-V        680    21.75     6.60     2.00    48.00       79    22.71     6.86     5.00    38.00      147    24.22     7.75     6.00    46.00
GMAT-Q        680    39.44     7.17    15.00    57.00       79    31.85     7.15    12.00    46.00      147    31.33     7.75    10.00    51.00
GMAT-T        680   500.41    75.15   200.00   720.00       79   463.75    86.00   252.00   640.00      147   472.99    86.82   280.00   700.00
VSSCOMP       680    52.49     9.21    16.80    79.20       79    45.47    10.01    18.00    65.60      147    45.87    10.49    20.20    72.00
RVPINDEX      680    30.14     9.54     2.01    70.35       79    37.76     8.40    18.39    56.97      147    40.37    10.54    11.29    69.42
TOEFLVEL      680   505.35    13.15   472.00   524.00       79   521.00     0.0    521.00   521.00      147   514.93    16.20   493.00   552.00
TOEFTOT       510   566.72    36.15   410.00   664.00       70   575.44    40.87   470.00   660.00      103   582.88    43.18   447.00   663.00
YESTOEFL      680     0.75     0.43     0.0      1.00       79     0.89     0.32     0.0      1.00      147     0.70     0.46     0.0      1.00
SEX           679     1.25     0.43     1.00     2.00       79     1.05     0.22     1.00     2.00      147     1.11     0.31     1.00     2.00
BIRTHYR       680    55.19     3.28    40.00    61.00       79    56.48     3.1[illegible]    44.00    62.00      147    55.51     3.85    42.00    61.00
US-UG=1       660     0.17     0.37     0.0      1.00       72     0.06     0.2[illegible]     0.0      1.00      142     0.26     0.44     0.0      1.00
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Appendix C-1

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BASIC STATISTICS FOLLOWED BY MISSING DATA REGRESSIONS-- BY ANALYSIS GROUP
SECTION F OF MENU OF 3/2/84--GMAT VALIDITY

BASIC STATISTICS BY ANALYSIS GROUP ON RAW VAIABLES


                        SUBTOTAL(10)    *                              GREECE GRP(11) *                                   PAKISTAN(12)    *

              N     MEAN     S.D.     MIN      MAX         N     MEAN     S.D.     MIN      MAX         N     MEAN     S.D.     MIN      MAX

GMAT-V      226    23.69     7.49     5.00    46.00       55    24.53     6.67     9.00    40.00       29    27.72     9.96     5.00    43.00
GMAT-Q      226    31.51     7.55    10.00    51.00       55    33.29     7.76    17.00    55.00       29    29.79     8.74    12.00    48.00
GMAT-T      226   469.76    86.23   252.00   700.00       55   485.85    78.77   339.00   684.00       29   492.28   114.25   200.00   710.00
VSSCOMP     226    45.73    10.33    18.00    72.00       55    48.01     9.80    31.20    74.80       29    46.43    13.13    24.20    73.80
RVPINDEX    226    39.45     9.93    11.29    69.42       55    39.21     9.78    14.38    60.16       29    46.72    11.91    20.01    64.70
TOEFLVEL    226   517.05    13.39   493.00   552.00       55   511.15     4.93   499.00   514.00       29   524.00     0.0    524.00   524.00
TOEFTOT     173   579.87    42.42   447.00   663.00       32   586.66    26.70   507.00   653.00        8   610.37    37.26   533.00   663.00
YESTOEFL    226     0.77     0.42     0.0      1.00       55     0.58     0.49     0.0      1.00       29     0.28     0.45     0.0      1.00
SEX         226     1.04     0.28     1.00     2.00       55     1.16     0.37     1.00     2.00       29     1.10     0.30     1.00     2.00
BIRTHYR     226    55.85     3.66    42.00    62.00       55    57.93     2.69    46.00    62.00       29    56.00     4.68    38.00    62.00
US-UG=1     214     0.19     0.39     0.0      1.00       55     0.35     0.48     0.0      1.00       26     0.65     0.48     0.0      1.00


                        MALAYSIA(13)    *                              INDIA(14)       *                                  NIGERIA(15)     *

              N     MEAN     S.D.     MIN      MAX         N     MEAN     S.D.     MIN      MAX         N     MEAN     S.D.     MIN      MAX

GMAT-V       64    24.41     6.09    14.00    37.00      204    29.44     7.39     8.00    45.00       44    18.34     6.24     3.00    37.00
GMAT-Q       64    30.08     6.83    13.00    47.00      204    36.46     8.14    18.00    56.00       44    22.09     6.15    12.00    36.00
GMAT-T       64   467.20    74.09   340.00   630.00      204   547.82    89.65   310.00   749.00       44   371.93    77.44   220.00   595.00
VSSCOMP      64    44.72     9.09    25.60    64.60      204    54.12    10.96    28.80    80.40       44    33.10     9.03    16.80    57.70
RVPINDEX     64    41.66     8.06    21.66    56.79      204    43.76     9.61    13.02    68.62       44    39.36     6.98    22.01    55.97
TOEFLVEL     64   559.00     0.0    559.00   559.00      204   556.00     0.0    556.00   556.00       44   553.00     0.0    553.00   553.00
TOEFTOT      30   599.40    38.81   523.00   660.00      144   621.22    33.96   510.00   688.00       11   584.00    40.98   517.00   643.00
YESTOEFL     64     0.47     0.50     0.0      1.00      204     0.71     0.46     0.0      1.00       44     0.25     0.43     0.0      1.00
SEX          64     1.28     0.45     1.00     2.00      204     1.10     0.30     1.00     2.00       44     1.05     0.21     1.00     2.00
BIRTHYR      64    55.97     2.99    50.00    60.00      204    56.89     3.87    42.00    62.00       44    53.27     3.49    45.00    60.00
US-UG=1      63     0.63     0.48     0.0      1.00      196     0.09     0.28     0.0      1.00       44     0.86     0.34     0.0      1.00


                        SINGAPORE(16)   *                              PHILLIPINES(17)*                                   SUBTOTAL(18)    *

              N     MEAN     S.D.     MIN      MAX         N     MEAN     S.D.     MIN      MAX         N     MEAN     S.D.     MIN      MAX

GMAT-V       18    29.44     4.31    19.00    38.00       37    31.03     5.66    18.00    40.00      396    27.41     7.98     3.00    45.00
GMAT-Q       18    37.00     6.33    24.00    49.00       37    31.24     7.19    18.00    47.00      396    32.88     8.98    12.00    56.00
GMAT-T       18   556.61    37.73   507.00   630.00       37   523.24    66.47   400.00   670.00      396   506.71   101.11   220.00   749.00
VSSCOMP      18    54.67     7.41    35.40    67.00       37    49.86     8.47    34.20    69.80      396    49.33    12.35    16.80    80.40
RVPINDEX     18    43.33     7.09    32.13    57.51       37    50.35     9.24    24.67    65.15      396    43.75     9.58    13.02    68.62
TOEFLVEL     18   556.00     0.0    556.00   556.00       37   594.00     0.0    594.00   594.00      396   557.36    14.51   524.00   594.00
TOEFTOT      10   637.00    16.01   620.00   673.00       28   644.46    15.41   617.00   670.00      231   619.74    35.89   510.00   688.00
YESTOEFL     18     0.56     0.50     0.0      1.00       37     0.76     0.43     0.0      1.00      396     0.58     0.49     0.0      1.00
SEX          18     1.22     0.42     1.00     2.00       37     1.32     0.47     1.00     2.00      396     1.15     0.36     1.00     2.00
BIRTHYR      18    55.83     2.46    50.00    59.00       37    56.35     3.82    45.00    62.00      396    56.17     3.87    38.00    62.00
US-UG=1      16     0.25     0.43     0.0      1.00       32     0.06     0.24     0.0      1.00      377     0.31     0.46     0.0      1.00
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BASIC STATISTICS FOLLOWED BY MISSING DATA REGRESSIONS-- BY ANALYSIS GROUP                        12:23:25   5/25/84  PAGE    5
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BASIC STATISTICS BY ANALYSIS GROUP ON RAW VAIABLES

                    FRANCE(19)      *                       EUROPEAN GRP(20*                          SUBTOTAL(21)   *

              N    MEAN     S.D.     MIN      MAX         N    MEAN     S.D.     MIN      MAX         N    MEAN     S.D.     MIN      MAX

GMAT-V       64    27.81    7.16     9.00    43.00       164    26.46    7.48     7.00    43.00       228    26.84    7.41     7.00    43.00
GMAT-Q       64    36.80    7.72    21.00    57.00       164    33.90    7.06    16.00    53.00       228    34.71    7.37    16.00    57.00
GMAT-T       64   531.45   84.40   350.00   740.00       164   504.63   82.85   340.00   730.00       228   512.16   84.16   340.00   740.00
VSSCOMP      64    53.48   10.38    30.60    80.60       164    49.77    9.75    27.40    77.60       228    50.81   10.07    27.40    80.60
MVPINDEX     64    41.12    9.45    19.29    66.61       164    41.52   10.10    14.74    65.88       228    41.41    9.93    14.74    66.61
TOEFLVEL     64   570.00    0.0    570.00   570.00       164   581.90   14.82   549.00   601.00       228   578.56   13.66   549.00   601.00
TOEFTOT      52   603.63   29.94   523.00   670.00       126   599.15   39.57   483.00   677.00       178   600.46   37.07   483.00   677.00
YESTOEFL     64     0.81    0.39     0.0      1.00       164     0.77    0.42     0.0      1.00       228     0.78    0.41     0.0      1.00
SEX          64     1.09    0.29     1.00     2.00       164     1.07    0.26     1.00     2.00       228     1.08    0.27     1.00     2.00
BIRTHYR      64    57.09    2.21    49.00    61.00       163    57.06    2.77    45.00    61.00       227    57.07    2.62    45.00    61.00
US-UG=1      56     0.05    0.23     0.0      1.00       155     0.16    0.37     0.0      1.00       211     0.13    0.34     0.0      1.00


                    OTHERS>=550(22)*                        OTHERS<550(23) *                          TOTAL ESL(24)   *

              N    MEAN     S.D.     MIN      MAX         N    MEAN     S.D.     MIN      MAX         N    MEAN     S.D.     MIN      MAX

GMAT-V       42    24.38    9.01     6.00    43.00        74    22.68    8.46     8.00    47.00      1762    24.14    7.76     2.00    48.00
GMAT-Q       42    30.45    9.26    10.00    48.00        74    32.36   10.03    11.00    50.00      1762    35.35    8.64    10.00    57.00
GMAT-T       42   469.12  111.30   210.00   700.00        74   465.03  103.33   230.00   730.00      1762   495.23   89.13   200.00   749.00
VSSCOMP      42    45.08   13.22    13.60    72.00        74    45.97   12.99    16.40    74.20      1762    49.83   11.00    12.40    80.60
MVPINDEX     42    41.32   10.51    19.93    67.88        74    37.27   11.61    10.93    70.07      1762    36.96   11.36     2.01    72.79
TOEFLVEL     42   593.00   20.51   555.00   630.00        74   514.12   20.54   452.00   549.00      1762   529.56   34.19   433.00   630.00
TOEFTOT      16   601.75   45.25   507.00   670.00        36   569.58   38.43   493.00   670.00      1203   584.87   43.03   410.00   680.00
YESTOEFL     42     0.38    0.49     0.0      1.00        74     0.49    0.50     0.0      1.00      1762     0.68    0.47     0.0      1.00
SEX          42     1.19    0.39     1.00     2.00        74     1.27    0.44     1.00     2.00      1761     1.18    0.38     1.00     2.00
BIRTHYR      42    56.05    3.83    42.00    62.00        74    54.53    4.69    40.00    61.00      1761    55.84    3.57    38.00    62.00
US-UG=1      40     0.30    0.46     0.0      1.00        71     0.32    0.47     0.0      1.00      1685     0.23    0.42     0.0      1.00
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BASIC STATISTICS FOLLOWED BY MISSING DATA REGRESSIONS-- BY ANALYSIS GROUP                              14:20:16   5/25/84  PAGE
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BASIC STATISTICS BY ANALYSIS GROUP ON T-SCALED VARIABLES

                        MIDEASTERN(1)  *                              THAILAND(2)    *                              TAIWAN(3)     *

            N     MEAN     S.D.      MIN      MAX          N     MEAN     S.D.      MIN      MAX          N     MEAN     S.D.      MIN      MAX

FYGPAVER    61    49.34    10.92    25.00    73.01         83    50.71     8.37    22.86    71.72        216    48.56     9.95    14.61    71.72
GMAT-V      61    49.05    10.77    26.77    74.96         83    45.53     7.48    30.57    64.51        216    47.77     9.10    16.67    89.96
GMAT-Q      61    46.95     9.35    21.40    67.35         83    49.63     8.98    27.76    70.52        216    56.23     7.98    20.00    82.55
GMAT-T      61    47.72    10.30    30.06    72.61         83    46.65     7.39    32.58    66.33        216    52.09     8.50    28.19    78.71
VSSCOMP     61    46.97     9.81    25.81    69.38         83    47.71     7.87    28.48    67.09        216    54.26     8.25    14.16    79.41
RVPINDEX    61    50.30    10.50    30.34    82.37         83    46.23     8.82    25.23    72.37        216    44.78     8.87    16.31    83.04
TOEFLVEL    61    35.23     6.49    23.89    54.50         83    36.54     4.78    25.84    41.86        216    45.86     3.01    35.11    60.17
TOEFTOT     27    48.12     9.45    29.47    73.60         51    46.31     9.15    26.94    65.80        181    45.98     8.69    26.81    72.72
YESTOEFL    61     0.44     0.50     0.0      1.00         83     0.61     0.49     0.0      1.00        216     0.84     0.37     0.0      1.00
SEX         61     1.15     0.35     1.00     2.00         83     1.43     0.50     1.00     2.00        216     1.45     0.50     1.00     2.00
BIRTHYR     61    51.22    11.07    17.08    64.73         83    52.35     7.91    24.73    64.26        216    50.13     8.45    19.12    68.97
US-UG=1     57     0.49     0.50     0.0      1.00         83     0.16     0.36     0.0      1.00        215     0.09     0.28     0.0      1.00


                        KOREA(4)       *                              JAPAN(5)       *                              HONG KONG(6)  *

            N     MEAN     S.D.      MIN      MAX          N     MEAN     S.D.      MIN      MAX          N     MEAN     S.D.      MIN      MAX

FYGPAVER   146    51.26     9.92    22.13    71.06        158    47.31    10.14    14.24    70.50         77    50.83     9.13    25.82    68.79
GMAT-V     146    48.29     8.20    28.54    68.76        158    42.78     7.32    19.29    61.60         77    51.96     8.33    35.22    67.07
GMAT-Q     146    56.96     7.82    35.39    76.39        158    54.29     7.60    27.66    70.91         77    50.77     7.94    34.98    76.88
GMAT-T     146    52.99     8.27    31.29    76.83        158    47.04     7.06    25.74    65.34         77    52.00     7.87    35.99    72.61
VSSCOMP    146    55.20     7.93    33.34    75.60        158    50.00     7.11    27.49    66.83         77    51.46     7.93    36.88    72.87
RVPINDEX   146    44.62     7.96    22.11    67.96        158    41.18     7.74    20.47    67.55         77    51.21     8.65    33.46    70.00
TOEFLVEL   146    45.04     3.51    36.79    59.73        158    41.99     3.04    30.36    55.81         77    43.08     3.35    33.90    56.24
TOEFTOT    117    46.69     6.89    31.53    72.31        133    45.75     7.14    25.01    66.41         28    50.23     6.79    31.80    61.01
YESTOEFL   146     0.80     0.40     0.0      1.00        158     0.84     0.36     0.0      1.00         77     0.36     0.48     0.0      1.00
SEX        146     1.04     0.20     1.00     2.00        157     1.06     0.24     1.00     2.00         77     1.25     0.43     1.00     2.00
BIRTHYR    146    45.09     9.76     6.17    63.77        158    41.50     9.02     9.67    60.31         77    54.50     8.00    30.72    68.02
US-UG=1    140     0.08     0.27     0.0      1.00        145     0.08     0.26     0.0      1.00         77     0.74     0.44     0.0      1.00


                        SUBTOTAL(7)    *                              MEXICO(8)      *                              S. AMERICAN(9) *

            N     MEAN     S.D.      MIN      MAX          N     MEAN     S.D.      MIN      MAX          N     MEAN     S.D.      MIN      MAX

FYGPAVER   680    49.37     9.84    14.24    71.72         79    48.20    11.04     9.41    69.04        147    50.02     9.29    18.33    72.00
GMAT-V     680    46.92     8.70    16.67    89.96         79    44.12     8.77    25.00    65.46        147    49.25    10.18    23.41    75.12
GMAT-Q     680    54.51     8.59    20.00    82.55         79    42.90     8.51    24.04    63.75        147    44.98     8.75    26.31    69.80
GMAT-T     680    50.44     8.36    25.74    78.71         79    41.97     9.71    23.78    68.77        147    46.48     9.72    22.62    73.44
VSSCOMP    680    52.36     8.27    14.16    79.41         79    41.65     9.52    23.04    67.16        147    45.53     9.36    22.61    74.09
RVPINDEX   680    44.81     8.86    16.31    83.04         79    48.32     7.56    30.17    67.80        147    52.05     9.77    24.16    77.69
TOEFLVEL   680    43.33     4.52    25.84    60.17         79    46.98     2.28    41.24    50.07        147    45.61     5.10    33.84    66.88
TOEFTOT    510    46.35     7.93    25.01    72.72         70    44.10    10.81    20.96    73.66        103    48.28    10.21    23.35    69.69
YESTOEFL   680     0.75     0.43     0.0      1.00         79     0.89     0.32     0.0      1.00        147     0.70     0.46     0.0      1.00
SEX        679     1.25     0.43     1.00     2.00         79     1.05     0.22     1.00     2.00        147     1.11     0.31     1.00     2.00
BIRTHYR    680    48.27     9.59     6.17    68.97         79    50.98     9.16    23.23    66.56        147    48.67    10.10    10.37    66.60
US-UG=1    680     0.17     0.37     0.0      1.00         72     0.06     0.23     0.0      1.00        142     0.26     0.44     0.0      1.00
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BASIC STATISTICS FOLLOWED BY MISSING DATA REGRESSIONS-- BY ANALYSIS GROUP
SECTION F OF MEMO OF 3/2/84--GMAT VALIDITY

BASIC STATISTICS BY ANALYSIS GROUP ON T-SCALED VARIABLES


                       SUBTOTAL(10)    *                        GREECE GRP(11) *                          PAKISTAN(12)    *

             N     MEAN    S.D.     MIN     MAX         N     MEAN    S.D.     MIN     MAX         N     MEAN    S.D.     MIN     MAX

FYGPAVER   226    49.38    9.97    9.41   72.00        55    50.24   10.25   17.00   75.78        29    49.81    9.59   33.41   67.71
GMAT-V     226    47.46   10.01   23.41   75.12        55    50.45    9.12   34.80   69.16        29    55.05   10.47   31.72   68.34
GMAT-Q     226    44.26    8.72   24.04   69.80        55    48.51    9.65   28.38   69.90        29    43.24    9.36   22.13   62.06
GMAT-T     226    44.91    9.95   22.62   73.44        55    49.54    9.03   33.64   77.79        29    49.82   10.11   28.46   69.46
VSSCOMP    226    44.18    9.60   22.61   74.09        55    49.15    9.27   31.07   74.22        29    46.65    9.82   28.01   68.22
RVPINDEX   226    50.74    9.23   24.16   77.69        55    51.40    9.61   32.05   75.01        29    58.87    9.21   39.71   73.77
TOEFLVEL   226    46.09    4.38   33.84   66.88        55    44.24    3.11   37.05   51.46        29    49.45    4.58   45.04   64.52
TOEFTOT    173    46.59   10.65   20.96   73.66        31    51.09    7.48   31.48   69.37         8    59.57    8.09   40.06   71.86
YESTOEFL   226     0.77    0.42    0.0     1.00        55     0.58    0.49    0.0     1.00        29     0.28    0.45    0.0     1.00
SEX        226     1.09    0.28    1.00    2.00        55     1.16    0.37    1.00    2.00        29     1.10    0.30    1.00    2.00
BIRTHYR    226    49.48    9.97   10.37   66.60        55    55.26    7.43   28.41   64.65        29    50.97   14.01    5.44   72.42
US-UG=1    214     0.19    0.39    0.0     1.00        55     0.35    0.48    0.0     1.00        26     0.65    0.48    0.0     1.00


                       MALAYSIA(13)    *                        INDIA(14)        *                        NIGERIA(15)     *

             N     MEAN    S.D.     MIN     MAX         N     MEAN    S.D.     MIN     MAX         N     MEAN    S.D.     MIN     MAX

FYGPAVER    64    53.28    8.00   35.36   68.65       204    51.57   10.44   26.52   74.69        44    45.77    8.60   23.75   64.22
GMAT-V      64    53.36    7.64   34.89   74.89       204    56.77    9.35   30.13   83.68        44    47.43    8.12   30.13   67.18
GMAT-Q      64    44.66    8.71   26.24   67.32       204    51.07    9.94   29.67   75.03        44    42.36    7.45   28.64   64.72
GMAT-T      64    48.74    8.58   28.72   77.53       204    55.65   10.53   32.02   87.41        44    43.04    8.31   23.47   58.32
VSSCOMP     64    46.66    8.82   26.24   75.26       204    54.00   10.56   31.22   80.54        44    42.34    7.90   26.23   60.62
RVPINDEX    64    56.13    7.59   38.43   70.65       204    55.33    8.44   33.88   76.57        44    53.01    7.89   34.30   69.00
TOEFLVEL    64    60.34    4.25   52.97   69.39       204    58.34    4.08   51.92   85.24        44    57.37    5.35   50.86   82.51
TOEFTOT     30    56.41    8.83   42.70   74.38       144    58.35    8.10   33.74   75.88        11    51.28    9.57   36.32   62.05
YESTOEFL    64     0.47    0.50    0.0     1.00       204     0.71    0.46    0.0     1.00        44     0.25    0.43    0.0     1.00
SEX         64     1.28    0.45    1.00    2.00       204     1.10    0.30    1.00    2.00        44     1.05    0.21    1.00    2.00
BIRTHYR     64    51.28    9.59   30.06   66.77       204    53.05    9.74   21.72   67.18        44    47.16    9.20   23.56   62.11
US-UG=1     63     0.63    0.48    0.0     1.00       196     0.09    0.28    0.0     1.00        44     0.86    0.34    0.0     1.00


                       SINGAPORE(16)   *                        PHILLIPINES(17)*                          SUBTOTAL(18)    *

             N     MEAN    S.D.     MIN     MAX         N     MEAN    S.D.     MIN     MAX         N     MEAN    S.D.     MIN     MAX

FYGPAVER    18    53.78    7.93   43.00   73.00        37    50.24    9.15   27.59   69.03       396    51.05    9.83   23.75   74.69
GMAT-V      18    54.33    6.35   44.47   65.53        37    57.30    7.54   35.70   76.55       396    54.99    9.27   30.13   83.68
GMAT-Q      18    48.31    7.32   36.22   62.91        37    41.52    9.68   24.68   65.93       396    47.47   10.12   22.13   75.03
GMAT-T      18    53.31    5.87   44.10   66.37        37    49.48    9.16   31.75   80.10       396    52.03   10.59   23.47   87.41
VSSCOMP     18    50.16    6.78   38.64   60.84        37    45.95    9.36   28.94   76.68       396    50.05   10.64   26.23   80.54
RVPINDEX    18    54.06    7.12   43.82   65.35        37    60.75    7.33   40.52   72.59       396    55.94    8.39   33.88   76.57
TOEFLVEL    18    58.21    3.20   51.66   63.89        37    68.89    2.89   64.66   76.16       396    58.88    5.84   45.04   85.24
TOEFTOT     10    61.24    6.41   51.17   74.75        28    63.01    4.74   54.80   72.59       231    58.49    8.28   33.74   75.88
YESTOEFL    18     0.56    0.50    0.0     1.00        37     0.76    0.43    0.0     1.00       396     0.58    0.49    0.0     1.00
SEX         18     1.22    0.42    1.00    2.00        37     1.32    0.47    1.00    2.00       396     1.15    0.36    1.00    2.00
BIRTHYR     18    49.38    7.98   30.65   61.08        37    51.08   10.79   12.46   67.86       396    51.60   10.24    5.44   72.42
US-UG=1     16     0.25    0.43    0.0     1.00        32     0.06    0.24    0.0     1.00       377     0.31    0.46    0.0     1.00
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BASIC STATISTICS FOLLOWED BY MISSING DATA REGRESSIONS-- BY ANALYSIS GROUP
SECTION F OF MEMO OF 3/2/84--GMAT VALIDITY

BASIC STATISTICS BY ANALYSIS GROUP ON T-SCALED VARIABLES

                         FRANCE(19)      *                         EUROPEAN GRP(20*                             SUBTOTAL(21)    *

               N    MEAN     S.D.     MIN      MAX        N    MEAN     S.D.     MIN      MAX        N    MEAN     S.D.     MIN      MAX

FYGPAVER      64   52.12     8.46    30.24    68.94      164   51.15    10.38    20.24    73.00      228   51.42     9.89    20.24    73.00
GMAT-V        64   52.35     9.42    30.51    70.22      164   53.01    10.00    31.90    80.53      228   52.83     9.85    30.51    80.53
GMAT-Q        64   50.74     9.11    27.79    73.21      164   48.21     9.38    26.88    70.52      228   48.92     9.37    26.88    73.21
GMAT-T        64   52.00     9.87    33.08    73.39      164   51.15    10.53    31.29    79.72      228   51.39    10.36    31.29    79.72
VSSCOMP       64   51.71     9.95    30.45    75.89      164   49.87    10.23    26.23    78.52      228   50.38    10.19    26.23    78.52
RVPINDEX      64   51.82     8.67    30.56    72.29      164   53.52     8.90    27.66    75.11      228   53.04     8.87    27.66    75.11
TOEFLVEL      64   60.22     5.09    55.54    79.47      164   62.69     5.38    49.58    80.10      228   62.00     5.41    49.58    80.10
TOEFTOT       52   51.99     8.33    39.48    68.49      126   53.02     9.98    16.48    74.46      178   52.72     9.56    16.48    74.46
YESTOEFL      64    0.81     0.39     0.0      1.00      164    0.77     0.42     0.0      1.00      228    0.78     0.41     0.0      1.00
SEX           64    1.09     0.29     1.00     2.00      164    1.07     0.26     1.00     2.00      228    1.08     0.27     1.00     2.00
BIRTHYR       64   52.45     7.32    24.73    63.77      163   52.06     8.84     8.41    65.80      227   52.17     8.44     8.41    65.80
US-UG=1       56    0.05     0.23     0.0      1.00      155    0.16     0.37     0.0      1.00      211    0.13     0.34     0.0      1.00


                         OTHERS>=550(22)*                          OTHERS<550(23) *                              TOTAL ESL(24)   *

               N    MEAN     S.D.     MIN      MAX        N    MEAN     S.D.     MIN      MAX        N    MEAN     S.D.     MIN      MAX

FYGPAVER      42   50.22     9.71    30.34    69.39       74   47.36    10.55    23.75    71.61     1762   49.98     9.99     9.41    75.78
GMAT-V        42   51.85    11.23    30.47    71.06       74   50.01    11.13    26.08    75.62     1762   50.00    10.00    16.67    89.94
GMAT-Q        42   46.47     9.84    24.52    67.43       74   48.59    11.94    24.57    73.02     1762   50.00    10.00    20.00    82.55
GMAT-T        42   49.11    12.65    26.28    77.45       74   49.16    12.36    18.33    74.85     1762   50.00    10.00    18.33    87.41
VSSCOMP       42   47.87    11.96    25.46    71.32       74   49.02    12.41    18.79    73.19     1762   50.00    10.00    14.16    80.54
RVPINDEX      42   53.98     8.93    36.99    69.99       74   50.69     9.94    30.86    73.43     1762   50.00    10.00    16.31    83.04
TOEFLVEL      42   67.18     9.69    51.36    92.87       74   45.43     7.28    25.91    60.17     1762   50.00    10.00    23.89    92.87
TOEFTOT       16   56.72     8.76    38.09    70.37       36   47.67     9.53    23.76    66.18     1202   50.00    10.00    16.48    75.88
YESTOEFL      42    0.38     0.49     0.0      1.00       74    0.49     0.50     0.0      1.00     1762    0.68     0.47     0.0      1.00
SEX           42    1.19     0.39     1.00     2.00       74    1.27     0.44     1.00     2.00     1761    1.18     0.38     1.00     2.00
BIRTHYR       42   50.06    11.15    16.08    64.08       74   47.30    12.39    10.08    64.73     1761   50.00    10.00     5.44    72.42
US-UG=1       40    0.30     0.46     0.0      1.00       71    0.32     0.47     0.0      1.00     1685    0.23     0.42     0.0      1.00
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Foreign ESL:
GMAT-V mean = 23.9
S.D. = 7.4
TOEFL mean = 584.8
S.D. = 42.5

$r_{vt}$ = .655

| GMAT-V | TOEFL TOTAL 200-212 | 213-237 | 238-262 | 263-287 | 288-312 | 313-337 | 338-362 | 363-387 | 388-412 | 413-437 | 438-462 | 463-487 | 488-512 | 513-537 | 538-562 | 563-587 | 588-612 | 613-637 | 638-662 | 663-687 | 688-700 | TOT. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 - 51 | | | | | | | | | | | | | | | | | | | | | | 0 |
| 47 - 49 | | | | | | | | | | | | | | 1 | | | | | | 1 | | 2 |
| 44 - 46 | | | | | | | | | | | | | | | | | 2 | 2 | 1 | 2 | | 7 |
| 41 - 43 | | | | | | | | | | | | | | 1 | | | 1 | 2 | 3 | 6 | | 13 |
| 38 - 40 | | | | | | | | | | | | | | | | | 2 | 9 | 15 | 2 | 1 | 29 |
| 35 - 37 | | | | | | | | | | | | | | | | 2 | 12 | 22 | 16 | 5 | | 57 |
| 32 - 34 | | | | | | | | | | | | | | | 3 | 9 | 19 | 21 | 17 | 5 | | 74 |
| 29 - 31 | | | | | | | | | | | | | | 2 | 4 | 18 | 28 | 46 | 18 | 3 | | 119 |
| 26 - 28 | | | | | | | | | | | | | 1 | 8 | 16 | 37 | 46 | 51 | 15 | 1 | | 175 |
| 23 - 25 | | | | | | | | | | | | 1 | 4 | 14 | 31 | 58 | 48 | 45 | 10 | 1 | | 212 |
| 20 - 22 | | | | | | | | | | | 1 | 1 | 5 | 15 | 44 | 44 | 39 | 15 | 3 | | | 167 |
| 17 - 19 | | | | | | | | | | | | 2 | 9 | 29 | 36 | 39 | 24 | 7 | 1 | | | 147 |
| 14 - 16 | | | | | | | | | | | | 3 | 12 | 27 | 28 | 29 | 15 | 4 | 1 | 1 | | 120 |
| 11 - 13 | | | | | | | | | | | | 3 | 8 | 16 | 9 | 12 | 2 | | | | | 50 |
| 8 - 10 | | | | | | | | | 1 | | 1 | 2 | 7 | 7 | 6 | 2 | | | | | | 26 |
| 5 - 7 | | | | | | | | | | | | 1 | 1 | 1 | 1 | 2 | | | | | | 6 |
| 2 - 4 | | | | | | | | | | | | | | | 1 | | | | | | | 1 |
| 0 - 1 | | | | | | | | | | | | | | | | | | | | | | 0 |
| TOTAL | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 13 | 47 | 121 | 179 | 252 | 238 | 224 | 100 | 27 | 1 | 1205 |

GROUP N MIN MAX MEAN SD N SD N-1 ERRORS BLANKS BELOW-RANGE-ABOVE

Scatterplot of GMAT-V and TOEFL Total scores for foreign ESL students.

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Foreign ESL:
GMAT-V mean = 24.1
S.D. = 7.8
GMAT-O mean = 35.4
S.D. = 8.7
$r_{vq}$ = .294

| | GMAT-O | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GMAT-V | 0 1 | 2 4 | 5 7 | 8 10 | 11 13 | 14 16 | 17 19 | 20 22 | 23 25 | 26 28 | 29 31 | 32 34 | 35 37 | 38 40 | 41 43 | 44 46 | 47 49 | 50 51 | TOT. |
| 50 - 51 | | | | | | | | | | | | | | | | | | | 0 |
| 47 - 49 | | | | | | | | | | | | | 1 | | | 1 | | | 2 |
| 44 - 46 | | | | | | | | | 1 | | | 2 | 1 | 2 | 2 | | | 1 | 9 |
| 41 - 43 | | | | | | | | | | | 3 | 2 | 4 | 4 | 2 | 1 | 5 | 3 | 24 |
| 38 - 40 | | | | | | | 1 | | 2 | 2 | 1 | 7 | 6 | 8 | 11 | 8 | 14 | 2 | 62 |
| 35 - 37 | | | | | | 1 | | 2 | 2 | 3 | 4 | 11 | 16 | 14 | 9 | 12 | 8 | 3 | 85 |
| 32 - 34 | | | | | | | 1 | 4 | 5 | 12 | 7 | 12 | 19 | 14 | 16 | 9 | 5 | 3 | 107 |
| 29 - 31 | | | | | | 1 | 1 | 3 | 11 | 18 | 15 | 15 | 32 | 12 | 21 | 22 | 22 | 6 | 179 |
| 26 - 28 | | | | | 1 | | 2 | 8 | 8 | 21 | 23 | 40 | 38 | 22 | 23 | 29 | 14 | 10 | 239 |
| 23 - 25 | | | | | | 1 | 7 | 15 | 16 | 26 | 34 | 29 | 42 | 35 | 38 | 28 | 25 | 9 | 305 |
| 20 - 22 | | | | | 1 | 1 | 2 | 11 | 12 | 27 | 19 | 39 | 35 | 33 | 21 | 21 | 10 | 4 | 236 |
| 17 - 19 | | | | 1 | 1 | 4 | 4 | 10 | 13 | 18 | 21 | 28 | 29 | 21 | 25 | 13 | 6 | 2 | 196 |
| 14 - 16 | | | | | | 3 | 7 | 10 | 17 | 15 | 21 | 24 | 24 | 11 | 13 | 10 | 4 | 2 | 161 |
| 11 - 13 | | | | | 1 | 5 | 7 | 5 | 5 | 10 | 6 | 10 | 8 | 7 | 7 | 2 | 2 | | 75 |
| 8 - 10 | | | | | 3 | 2 | 2 | 5 | 2 | 6 | 6 | 3 | 3 | 4 | 3 | 3 | 1 | | 43 |
| 5 - 7 | | | | 1 | 1 | 1 | | 4 | 1 | 1 | 1 | 1 | | | 3 | 1 | 1 | | 16 |
| 2 - 4 | | | | 1 | | 2 | | | | | | | 2 | | | | | | 5 |
| 0 - 1 | | | | | | | | | | | | | | | | | | | 0 |
| TOTAL | 0 | 0 | 0 | 3 | 8 | 21 | 34 | 77 | 95 | 159 | 161 | 223 | 260 | 187 | 194 | 160 | 117 | 45 | 1744 |

Scatterplot of GMAT-V and GMAT-O scores for foreign ESL students

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Appendix C-4

Foreign EPL:
GMAT-V mean = 33.5
S.D. = 8.1
GMAT-Q mean = 35.5
S.D. = 9.0

$r_{vq} = .544$

| | GMAT-Q | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GMAT-V | 0<br>1 | 2<br>4 | 5<br>7 | 8<br>10 | 11<br>13 | 14<br>16 | 17<br>19 | 20<br>22 | 23<br>25 | 26<br>28 | 29<br>31 | 32<br>34 | 35<br>37 | 38<br>40 | 41<br>43 | 44<br>46 | 47<br>49 | 50<br>51 | TOT. |
| 50 - 51 | | | | | | | | | | | | | | 1 | | | | | 1 |
| 47 - 49 | | | | | | | | | | | | | | | 1 | | 1 | | 2 |
| 44 - 46 | | | | | | | | | | | 1 | 1 | | 2 | 2 | 2 | 2 | 1 | 11 |
| 41 - 43 | | | | | | | | | 1 | 1 | 1 | 1 | 2 | 2 | 4 | 2 | 2 | 2 | 18 |
| 38 - 40 | | | | | | | | | | 1 | 2 | 4 | 4 | 3 | 1 | 4 | 2 | 6 | 27 |
| 35 - 37 | | | | | | | 1 | 2 | | 2 | 1 | 3 | 3 | 4 | 3 | 1 | 1 | | 21 |
| 32 - 34 | | | | | | | | | 1 | 2 | 2 | 3 | 2 | 4 | 3 | | | 1 | 18 |
| 29 - 31 | | | | | | 1 | | 1 | 1 | 1 | 2 | | 1 | 3 | 3 | 1 | | | 14 |
| 26 - 28 | | | | | | | 1 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 4 | 1 | | | 19 |
| 23 - 25 | | | | | | | | 1 | 3 | 2 | 1 | | | 2 | | | | | 9 |
| 20 - 22 | | | | | | | | 2 | | | | 3 | | | 1 | | | | 6 |
| 17 - 19 | | | | | | 1 | 1 | 1 | | 2 | | 1 | | | | | | | 6 |
| 14 - 16 | | | | | | 1 | 1 | 1 | 1 | | | | | | 1 | | | | 5 |
| 11 - 13 | | | | | | | | | | | | | | | | | | | 0 |
| 8 - 10 | | | | | | | | | | | | | | | | | | | 0 |
| 5 - 7 | | | | | | | | | | | | | | | | | | | 0 |
| 2 - 4 | | | | | | | | | | | | | | | | | | | 0 |
| 0 - 1 | | | | | | | | | | | | | | | | | | | 0 |
| TOTAL | 0 | 0 | 0 | 0 | 0 | 3 | 4 | 10 | 8 | 13 | 12 | 18 | 14 | 23 | 23 | 11 | 8 | 10 | 157 |

Scatterplot of GMAT-V and GMAT-Q scores for foreign EPL students

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